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THE

NINTH AND TENTH

nnual Reports

OF

BOARD OF PUBLIC WORKS,

TO

GENERAL ASSEMBLY OF VIRGINIA:

ALSO, A COLLECTION OF

ACTS AND RESOLUTIONS

OF THE

GENERAL ASSEMBLY,

t the Sessions of 1824-'5 *and* 1825-'6,

D OTHER DOCUMENTS,

ON SUBJECTS CONNECTED WITH

D FOR INTERNAL IMPROVEMENT.

VOL. IV.

RICHMOND:

d by Shepherd & Pollard.

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NINTH

Annual Report

OF THE

PRESIDENT AND DIRECTORS

OF THE

BOARD OF PUBLIC WORKS,

TO THE

GENERAL ASSEMBLY OF VIRGINIA,

TWENTIETH DECEMBER, 1824.

RICHMOND:
PRINTED BY T. W. WHITE, MARKET-BRIDGE.
1825.

OFFICE OF THE BOARD OF PUBLIC WORKS,
RICHMOND, 22d December, 1824.

Sir,

I have the honor to lay before the General Assembly, the annual report of the president and directors of the Board of Public Works, prepared in conformity to the act entitled, "An act creating a fund for internal improvement."

I have the honor to be,
With great respect,
Your obedient servant,
JAMES PLEASANTS,
President of the Board of Public Works.

The honorable the Speaker of the House of Delegates.

REPORT.

The president and directors of the Board of Public Works, in obedience to the act, entitled "An act to create a fund for internal improvement," beg leave to report to the General Assembly, that the fund for internal improvement consisted, on the first day of December, 1824, of the following stocks, viz:

PERMANENT FUNDS.

125 1-2	shares in the Little River turnpike company	$ 12,550 00
70	shares in the Dismal Swamp canal company	17,500 00
125	shares in the Appomattox company,	12,500 00
70	shares in the Potowmac company,	31,111 11
250	shares in the James river company,	50,000 00
7947	shares in the Bank of Virginia,	794,700 00
3334	shares in the Farmers' Bank of Virginia,	333,400 00
900	shares in the Bank of the Valley,	90,000 00
231	shares in the North-Western Bank of Virginia,	23,100 00
82	shares in the Swift Run Gap turnpike company,	4,100 00
Certificates of James river company loan, purchased with the bonus paid by the Farmers' Bank of Virginia, for the renewal of their charter, under the act of 6th March last,		50,000 00
	Total amount of permanent funds,	$1,418,961 11

DISPOSABLE FUNDS.

Stocks acquired by the application of the income of the fund for internal improvement, and disposable according to the 13th section of the act creating that fund, viz:

375 shares in the Bank of Virginia, (loaned to the Richmond dock company,)		$37,500 00
35 shares in the Farmers' Bank of Virginia,		3,500 00
50 shares in the Bank of the Valley,		5,000 00
500 shares in the United States Bank, (loaned to the Dismal Swamp canal company,)		50,000 00
34 shares in the James river company,		6,800 00
186 shares in the Dismal Swamp canal company,		46,500 00
1000 shares in the Richmond dock company,		62,500 00
672 shares in the Leesburg turnpike company,		33,600 00
920 shares in the Swift Run Gap turnpike company,		46,000 00
50 shares in the Cartersville bridge company,		5,000 00
140 shares in the Monongalia navigation company, of which was paid prior to 1st December, 1823,	$ 5,520 00	
And since that time,	2,380 00	
		7,900 00
800 shares in the Roanoke navigation company, of which was paid prior to the 1st December, 1823,	66,400 00	
And since that time,	4,000 00	
		70,400 00
Amount carried forward,		$ 374,700 00

	Amount brought forward,		$ 374,700 00
480	shares in the Fallsbridge turnpike company, of which was paid prior to the 1st December, 1823,	8,000 00	
	And since that time,	8,000 00	
			16,000 00
200	shares in the Wellsburg and Washington turnpike company, of which was paid prior to the 1st December, 1823,	1,000 00	
	And since that time, in full,	4,000 00	
			5,000 00
400	shares in the Snickers' Gap turnpike company, of which was paid prior to the 1st December, 1823,	5,000 00	
	And since that time,	10,000 00	
			15,000 00
400	shares in the Fairfax turnpike company, of which has been paid the first instalment of		900 00
300	shares in the Lynchburg and Salem turnpike company, of which has been paid the first instalment of		5,000 00
300	shares in the Fauquier and Alexandria turnpike company, of which has been paid the first instalment of		7,500 00
Loan	to the Richmond dock company, of which was paid prior to the 1st December, 1823,	5,000 00	
	And since that time, in full,	7,500 00	
			12,500 00
Loan	to the Dismal Swamp canal company,		50,000 00
	Total amount of disposable funds,		$ 486,600 00

JAMES RIVER COMPANY SURPLUS AND APPROPRIATION FUND.

James river certificates of loan, purchased with the unemployed money set apart out of the fund for internal improvement for the payment of the interest on certificates of James river company loans,	$ 40,300 00

Total amount of the fund for Internal Improvement, viz.	
Permanent fund, in stocks,	$ 1,418,961 11
Disposable fund, in stocks and loans,	486,600 00
Surplus and appropriation fund, in James river certificates,	40,300 00
	$ 1,945,861 11

Upon the productive part of the permanent and disposable funds, there have been received since the 1st of December, 1823, for dividends and interest, the following sums, viz.

From the Bank of Virginia,	$ 46,314 50
From the Farmers' Bank of Virginia,	13,476 00
From the Bank of the Valley,	6,600 00
From the North-Western Bank of Virginia,	1,589 23
From the Dismal Swamp canal company, for January and July, 1824, dividends on 500 shares United States' Bank stock loaned them,	2,500 00
From the Richmond dock company, for January and July, 1824, dividends on 375 shares of Virginia Bank stock loaned them,	1,312 50
From ditto, for interest in full to 1st July, 1824, on loan of $ 12,500,	450 00
From the James river company, for dividends,	6,816 00
From ditto, for interest on James river company certificates of loan,	290 91
From the Little River turnpike company,	313 75
Total amount of receipts,	79,662 89
Add balance of cash in the treasury, the 1st December, 1823,	8,261 78
	$ 87,924 67

Out of which there have been disbursed the following sums, viz :

For the subscriptions to the stock of the Wellsburg and Washington turnpike company, in full,	$ 4,000 00	
Fallsbridge turnpike company, 2d instalment,	8,000 00	
Snickers' Gap turnpike company, 2d and 3d instalments,	10,000 00	
Roanoke navigation company, 10th requisition,	4,000 00	
Monongalia navigation company, 3d requisition,	2,380 00	
Fairfax turnpike company, 1st instalment,	900 00	
Lynchburg and Salem turnpike company, 1st instalment,	5,000 00	
Fauquier and Alexandria turnpike company, 1st instalment,	7,500 00	
For loan to the Richmond dock company, in full,	7,500 00	
		49,280 00
For the annual appropriation to the James river company fund,		18,000 00
For the salary of the principal engineer to 1st October, 1824,		3,781 95
For the contingent expenses of surveys and examinations, prior to 1st December, 1823,		525 77
For advances made the principal engineer to defray contingent expenses of surveys, and to be accounted for by him,		3,655 76
For compensation (in part) to the commissioners appointed to aid in the survey of James river,		555 00
For compensation and mileage to the members of the Board of Public Works at three meetings, in December, January, and May last,		2,73[illegible]
Amount carried forward,		$ 78[illegible]

Amount brought forward,	$ 78,537 58
For premium of 2 1-2 per cent. on certificates of James river company loan for $ 50,000 purchased with the bonus received in May last from the Farmers' Bank of Virginia,	1,250 00
For one-third of a year's salary to the 2d Auditor,	500 00
For one-third of a year's salary to the 2d Auditor's clerk,	233 33
For one year's salary to the collector of the board,	500 00
For the services of the door-keeper, postages, candles, &c.	87 23
For a theodolite, $ 100; compass and chain, $ 37 50; and level, $ 150,	287 50
For Shepherd & Pollard's bill for printing 150 copies of the 8th annual report of the Board of Public Works,	312 68
For fee-bill of the clerk of Henrico, for recording mortgage from the mayor, aldermen, &c. of the city of Richmond, to the president and directors of the Board of Public Works,	3 50
For 6 copies of Shriver's Map of Ohio and Chesapeake Canal	18 00
For this sum advanced to the James river company surplus fund beyond its cash on hand,	1,987 96
Total amount of disbursements,	83,717 78
Leaving a balance in the treasury on the 1st December, 1824, applicable to objects of internal improvement under the orders of the Board, of	4,206 89
	$ 87,924 67

The certain and probable charges upon the income of the fund for internal improvement, for the current year, will be,

The payment of interest on certificates of loans of the James river company,	$ 44,695 90
Amount carried forward,	$ 44,695 90

Amount brought forward,		$ 44,695 90
Further requisitions by the Roanoke navigation company,		6,400 00
3d instalment to Fallsbridge turnpike company,		8,000 00
4th instalment to the Snickers' Gap turnpike company,		5,000 00
2d and 3d instalments to the Lynchburg and Salem turnpike company,		10,000 00
2d and 3d instalments to Fauquier and Alexandria turnpike company,		15,000 00
Further requisitions to Monongalia navigation company,		6,000 00
1st instalment to Manchester and Petersburg turnpike company,		4,000 00
2d and 3d instalment to Fairfax turnpike company,		1,800 00
1st instalment to Slate river company,		1,725 00
1st and 2d instalment of loan to Dismal Swamp canal company,		15,000 00
Map of Virginia, in full,		4,478 29
		$ 122,199 19

To meet which, the resources of the fund will be,

The balance in the treasury the 1st Dec. 1824,		$ 4,206 89
Surplus of tolls, after paying dividends, salaries, and expenses to be paid by the James river company in January next,	$ 9,000 00	
And in July following,	5,000 00	
Interest on James river certificates belonging to surplus fund,	2,291 50	
		16,291 50
Premium on $ 400,000 loan, obtained under authority of the act of 8th of March last, by the James river company.		10,000 00
From the Farmers' Bank of Virginia,		13,476 00
From the Bank of Virginia,		46,314 50
From the James river company, for dividends,		6,816 00
Amount carried forward,		$ 97,104 89

Amount brought forward,	$ 97,104 89
From ditto for interest on certificates of loan for $ 50,000,	3,000 00
From the Little River turnpike company,	313 75
From the Bank of the Valley,	6,600 00
From ditto, (due in July, 1824,)	3,300 00
From the North-Western Bank of Virginia,	1,386 00
From the Dismal Swamp canal company, for dividends on 500 shares United States' Bank stock loaned them,	2,500 00
From ditto, for interest on loan of $ 50,000,	3,000 00
From ditto, for do. do. due prior to 1st December, 1824,	5,250 00
From the Richmond dock company, for dividends on 375 shares Bank of Virginia stock loaned them,	1,312 50
From ditto, for interest on loan of $ 12,500,	750 00
	$ 124,517 14
From which deduct the amount of charges payable within the year,	122,199 19
And there will remain a probable surplus of	$ 2,317 95

This view of the fund for internal improvement exhibits a probable surplus. It is proper, however, here to remark, that the enumeration of the certain and probable charges payable out of the income of the fund during the present year, does not include any appropriation to the contingent fund to defray the expenses of surveys, the salary of the engineer and assistants, and the expenses of the board. There will probably be required for these objects, in addition to the surplus of $ 2,317 95, a sum between seven and eight thousand dollars. This amount can in no other way be supplied, than by borrowing on an hypothecation of some portion of the acquired stocks, which there is no reason to doubt can be effected. It would appear, from a comparison of the state of the fund at this time with that exhibited to the General Assembly in the last annual report, that the receipts of the present year, upon the productive fund, exceed those of the last year by the sum of $ 21,108 52. This, in fact, is not the case ; and the excess is accounted for by the premium on the loan of $ 400,000 for the James river company, and dividends and interest due within that year, but not paid, being included in the estimate of the present. Exclusive of these sums, the regular revenue of the present year is about the same as that of the last year, viz: $ 82,910 23. The charges upon the income, on the other hand, for the present year, exceed those of the last by the sum of $ 32,907 57; to which may be added the sum of $ 7,000 for contingent expenses, provided for in the last, but not embraced in the present estimate, shewing an increase of expenditure of $ 39,907 57. This great increase of expenditure arises, in a great degree, from the payment of the interest on the loans made in pursuance of the acts of the General Assembly for the improvement of the James and Jackson's rivers, with which the fund for internal improvement is charged, and this year amounts to the sum stated in the estimate of charges to be provided for; but will be advanced in the next year to the sum of $ 49,800. A part of the sum necessary to pay the interest is derived from that company, and is this year estimated at $ 14,000. It may, however, be augmented by an increase of tolls, or diminished by an increase of general expenses, or of expenditure on account of repairs during the progress of the work. It will be seen in the estimate of receipts to defray the expenses of the current year, that the sum of $ 10,000, the premium on the loan of $ 400,000, authorised by the act of the 8th of March last, is included. This sum has not been paid over to the fund for internal improvement for want of authority on the part of the James river company to do so, as appears by reference to the proceedings of that board on this subject; but, inasmuch as the income of the fund is burthened with the payment of interest on that and previous loans, it is suggested to the General Assembly to pass an act authorising the treasurer to pay to the Board of Public Works that sum, to the credit of the income of the fund for internal improvement.

From the exhibit made of the state of the fund, it will appear that no new engagements, to be complied with during the present year, can be entered into. In the course of next year, subscriptions to the stocks of companies, and the last payment on account of the map of the State, will have been discharged, amounting to $ 23,568 29; which will relieve the income of the fund by so much; and during the succeeding year, from the same cause, the fund applicable to objects of internal improvement will be farther liberated in the sum of $ 28,100; which, it is hoped, will enable the board to extend aid and encouragement to the improvement of sections of the State which have not derived any immediate benefit from the fund created for that object.

Very few of the corporations, to the stock of which this board has been required to subscribe, as yet pay any dividends; most of them, however, are in progress towards completion; and, in a few years, it may, with reason, be expected that the fund will derive some revenue from that source, wherewith the patronage of the board may be extended to new works of improvement.

At a meeting of the board in May last, convened to carry into effect the act of the General Assembly of the 8th of March preceding, Benjamin Wright, esquire, of the State of New York, was appointed engineer, and Richard N. Venable, George Love, and Philip R. Thompson, commissioners, to make, in conjunction with the civil engineer of the State, a survey and examination of James and Jackson's rivers, between the Maiden's Adventure falls and the mouth of Dunlap's creek, and to report an estimate of the probable cost of the improvements between those points. It is much to be regretted, that this important work was not accomplished in a manner and in time to enable the engineers and commissioners to make a report and estimate to be laid before the General Assembly at its present meeting. The reasons for the failure, which cannot but be satisfactory, will be found in the report of the assistant engineer and commissioners, which, with the correspondence on that subject, is herewith communicated, as containing all the information at present in possession of the board. The engineer of the State, in addition to the survey of the James and Jackson's rivers, made an examination of the improvements on the Monongahela river, and also examined the Fauquier and Alexandria turnpike, and the Little River turnpike roads; upon each of which he has made reports, which will accompany this.

A letter from the principal engineer, in which his reasons are stated for not having made his annual report in time to be laid before the General Assembly, is also communicated. That report, with an estimate of the costs of farther improvements on James and Jackson's rivers, as required by a resolution of the board, will be made to the members ex-officio, in the recess of the board, and will be communicated to the General Assembly by the president of the board.

Copies of returns and reports from the
Upper Appomattox company,
Cartersville Bridge company,
Dismal Swamp canal company,
Fairfax turnpike company,
Fauquier and Alexandria turnpike company,
Fallsbridge turnpike company,
Leesburg turnpike company,
Little River turnpike company,
Lynchburg and Salem turnpike company,
Manchester and Petersburg turnpike company,
Potowmac company,
Richmond dock company,
Roanoke navigation company,
Snicker's Gap turnpike company,
Swift Run Gap turnpike company, and
Wellsburg and Washington turnpike company,
Which are all the companies with which the board is connected, with the exception of the Monongalia navigation company,* a report from which has not been received, are herewith submitted.

JAMES PLEASANTS,

President of the Board of Public Works.

December 20, 1824.

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* The Monongalia navigation company's report being since received, will be printed with the other documents accompanying this report.

REPORT OF PRINCIPAL ENGINEER,
17TH DECEMBER, 1824.

CONTAINING A SUMMARY REPORT OF HIS PROCEEDINGS IN THE YEAR 1824.

RICHMOND, December 17, 1824.

To the President and Directors of the Board of Public Works.

GENTLEMEN,

Pursuant to the instructions of the ex-officio members of your honorable body, in date of the 20th March last, I repaired early in April to the Gap of James river through the Blue Ridge, for the purpose of locating the canal at that place. I next returned to Richmond to receive new instructions as to my farther operations.

Immediately after your session, I set out for Clarksburg, where I examined the works in progress on the Monongahela; from Clarksburg I returned by the way of Alexandria, and examined the Alexandria and Fauquier turnpike, together with the two routes proposed for the unfinished part of this road, between Buckland and Warrenton. I arrived at Richmond on the 20th of June, and reported to the board ex-officio on these two operations. I also took notice, in the same report, of the state of the Little River turnpike. I then learned that part of my location through the Blue Ridge had been changed, and I addressed a report to the president and directors ex-officio on this subject.

After having completed these reports, I joined the survey of James river, and remained actively engaged in this important operation during the whole season, until the month of November. I had, in the meantime, adjusted some difficulties that had arisen from my report on the operations at the Blue Ridge.

On the 1st of November, in consequence of a letter from Judge Wright, from which it appeared that a late illness would prevent his coming to Virginia this year, I adjourned the survey and returned to Richmond, intending to prepare immediately my private reports, in order that they might be ready for your early meeting. But, on my arrival at Richmond, I learned that Judge Wright was daily expected. He landed on the 9th of November, and we soon after set out to examine the works in progress. This kept me employed out of Richmond until the 2d of the present month. This late expedition and the meetings of the board of engineers and commissioners during the time it was employed in arranging the report which has been laid before you, have put it out of my power to prepare my own reports and draughts for the time when they are usually expected. I hope, however, that I shall be able to complete them before the end of this month.

Very respectfully,

Your most obedient servant,

C. CROZET, *P. Engineer.*

REPORTS

On J. G. Jackson's improvements on the Monongahela river—On Fauquier and Alexandria turnpike road—On Little River turnpike—By C. CROZET.

REPORT ON JOHN G. JACKSON'S IMPROVEMENTS ON THE MONONGAHELA RIVER.

RICHMOND, 28th June, 1824.

To the President and Directors ex-officio of the Board of Public Works.

GENTLEMEN,

In consequence of the instructions I received at the last meeting of the general board, I left this place on the 20th May last, and arrived at Clarksburg on the 29th. I proceeded immediately to the examination of every circumstance relative to the dams and saw-mills in construction on the west-fork of the Monongahela, under J. G. Jackson's contract.

An almost unprecedented freshet has considerably injured the works. The waters of the west-fork rose in a few hours to the height of at least 30 feet, and even the company dam, (Chapman's,) that had stood for many years, had been partially carried away. The circumstances, under which I viewed the works, were consequently very unfavorable.

The dams are seven in number and designated by their order, beginning from the lowest: the seventh is consequently nearer to Clarksburg. As far as the dams, locks and mills were completed, it appeared to me that the contractor had complied with his contract. As to the slopes, by an order of the board of directors of the company of the 17th of June, 1822, published in the volume of the proceedings of the Board of Public Works for the year 1822, page 30, they have been made adjoining to the lock, instead of the place designated in the contract. In regard to the abutments, the contractor was indeed required to raise them up to high-water mark; this, of course, must be understood of those places only where a rocky shore cannot be used for the dam to abut against, and probably, also, of common freshets, as otherwise he would have to elevate them to the considerable height of 30 or 36 feet. Sufficient pains have been taken to secure the abutments. Those which are finished and not supported by rock, have been made from 16 to 17 feet high.

Dam No. 7, the nearest to Clarksburg, is located below the 47th mile, near Simpson's creek. Its length is 325 feet, including lock and saw-mill; it averages 10 1-2 feet in height at the breast, and slopes about 3 feet up-stream. The abutment next to the saw-mill, besides its length, is protected by a broad stone wall, constructed on the whole length of the abutment on the up-stream side of it. The saw-mill itself rests on a broad crib filled in with stone. Considerable difficulty was experienced at a place where much gravel had accumulated, so that this dam will probably be the most expensive; it has stood the violence of the freshet, although some rocks weighing many tons have been torn up and removed from the bottom of the river, immediately below it. The whole dam is completed, as well as the saw-mill; but only part of the lateral walls of the lock are made. The slope which it appears was finished, has been carried away; only a few pieces of timber have been left by the stream.

Dam No. 6, below the 51st mile and above 10 mile creek. This dam is the most injured; part of it, as well as the adjoining abutment, has been carried off. The slope will require considerable repairs, its frame having been raised up by the power of the stream. The lock is in about the same state of forwardness as that at No. 7. The saw-mill is finished. The dam is 285 feet long, including all; its height is 8 feet; the up-stream side of it is only 4 feet. The slope is 42 feet long and 25 wide.

Dam No. 5, below the 54th mile, at Shintown. This dam measures 251 feet in length, 9 feet in height at the breast; it is not yet planked. Here, as above, the turbulence of the current has removed large stones from below the dam, which has sunk in the middle in consequence of it. This part will have to be re-built. The frame of the saw-mill is up. The lock is in the same state of progress as those above. The slope is completed; it measures 28 feet in length, and is but little injured.

Dam No. 4, at the 58th mile, above Bingamon creek, was built at a place where a fish-dam formerly stood. This required the previous removal of all the accumulated gravel. The site of the saw-mill and abutment has been partially dug out of a slaty bank. This dam is 278 feet in length, all included; 8 1-2 feet high. The lock has not been commenced. Only the frame of the saw-mill is up. The slope is 28 feet long. The dam and slope are not yet planked over.

Dam No. 3, below the 60th mile, measures 259 feet in length, 10 1-2 in height. It is not planked. The site of the saw-mill has been partially dug out of the slaty bank. The frame of the saw-mill, which was up, has been carried away. The principal crib of the lock is partly up, and filled with stones. The slope is 35 feet long. It was finished, but its flooring has been raised out of its place by the freshet.

Dam No. 2, below the 65th mile, at the mouth of Booze creek. This dam is not yet commenced; only some timber has been hauled for it.

Dam No. 1, below the 66th mile and White rock. This dam is 239 feet long, and 10 high at the breast. With the exception of 30 feet, it has received its planking. The saw-mill was half finished, but has been carried away. The principal crib of the lock is partially raised. The slope is 42 feet long. It has received but little injury, although the freshet rose here higher than above; but the current operated principally upon the other shore, where a length of about 100 feet of the bank, immediately below the dam, was completely torn away; and had the freshet lasted, the abutment must undoubtedly have given way. It will have to be secured by a wing wall, or a bed of fascines, carefully picketed down along the chasm made in the bank by the torrent.

In order to form my estimates, I adopted, among all the aberrations of the answers to my inquiries, the medium which appeared to me the most reasonable cash price for the hire of hands, and also for some materials. These data, combined with the minute calculation of the time necessary to get, transport according to distance, and put in their places the various materials employed, gave me the following results:

Estimate of the work existing on the west fork of the Monongahela, in June, 1824.

At site No. 7,	$ 3,211 00
No. 6,	2,145 00
No. 5,	1,658 00
No. 4,	1,502 00
No. 3,	1,737 00
No. 2,	
No. 1,	1,356 00
Total,	$ 11,609 00

Probable value of work carried away.

At site No. 7,	$ 130 00
No. 6,	180 00
No. 5,	
No. 4,	
No. 3,	240 00
No. 2,	
No. 1,	250 00
Total,	$ 800 00

In order to complete the account of this operation, it may be proper to add here, that, by an order of the company of the 10th of August, 1822, J. G. Jackson was authorised to contract for building a log house at each site.

The house at No. 7,	is finished, and worth	$ 350
No. 6,	partly finished,	200
No. 4,	do.	150
No. 3,	do.	150
No. 1,	do.	100

By an order of the same day, J. G. Jackson was also authorised to contract for the sites of dams. His contracts were approved by an order of the 23d of November following. In some places, he had to buy more land than was actually required for the sites; which being limited to one acre, writs of ad quod damnum were executed. From the copy I have procured, it appears that the values of the sites are as follows:

At No. 7,	on each side,	$ 10,	$ 20	Total amount of land condemned, $ 245.
At No. 6,	do.	5,	10	
At No. 5,	west side,	15,	115	
	east side,	100,		
At No. 4,	west,	5,	20	
	east,	15,		
At No. 3,	west,	5,	20	
	east,	15,		
At No. 2,	west,	5,	20	
	east,	15,		
At No. 1,	west,	30,	40	
	east,	10,		

In regard to the plan of the works and the contracts, it appeared to me that the works have not been contrived to answer the best possible purpose. In the 1st place, a thickness of 6 feet only, is too small for the cribs of locks of as much as 8 feet lift; they certainly cannot resist the pressure of the lower gates, nor the power of so violent a stream. At the upper end, the crib is supported by the slope, but at the lower end, I do not think that a thickness of 8 or 9 feet would be too much. The contractor seems to have perceived this defect, for in dams No. 7, 5, 3 and 1, he has made the cribs between 7 and 8 feet thick.

It is very doubtful whether locks and gates of such a height, can resist the violence of a stream which rises to such an elevation. I think that it would have been more advisable to divide the lift and make two low locks, instead of a high one. The expediency of this measure is also supported by another consideration still more intimately connected with the object of the works.

There is usually too little water in the river to supply at the same time the wants of a somewhat active navigation, and the wasting power of a saw-mill. This ought to have suggested the propriety of making the locks only 8 feet wide instead of 16, and of also dividing the lift; by this means, only one fourth of the water would have been required for each boat, and three fourths of that important expense might have been saved, and at the same time, the locks would have been more secure in a freshet, the pressure of the gates much diminished, and they would have presented to the impetuosity of the current, a much smaller surface.

The report on the examination of this river states, that the boats used are 12 feet wide; but a new mode of navigation requires a new kind of boats, and constant navigation with small boats is certainly preferable to a slow and precarious one with large boats. The use of this latter in such a case, ought to be confined to the slopes in time of freshets.

Again, the contract is very indefinite as to the length of the locks: it seems to be understood, that the length of 70 feet prescribed in the contract is that of the crib; but allowing for outlet walls, and the free turning of the gates, a lock of 16 feet wide will be reduced to only 50 feet in the clear, which is rather too little.

In order to secure the crib against the lateral pressure of the gates, I would propose opposite the lower gates, to connect the two cribs at top by a kind of strong bridge of timber.

As to the slopes, they would answer a better purpose, if they were protected on the water side by a crib, instead of a mere breast of logs: This would make them more strong, and render the descent of boats perfectly safe. As they are made now, with a single log on the side to protect boats against getting over, I think them dangerous. In order to prevent their top from being raised by the eddy of the water in a freshet, it ought to be connected with the sills, otherwise than by uprights framed into them by square tenons, which are too weak a dependence. Double uprights, notched so as to embrace between them both the lower sills and the upper beams, and well pinned together, would be preferable. These connected by cross ties made steady by the weight of stones on them, would probably resist much better than the frames which have been made.

THE FAUQUIER AND ALEXANDRIA TURNPIKE.

I examined this road on my return from Clarksburg, and found it in as good order as could be expected after the abundance of vernal rain that fell this year. The road is completed as far as Buckland, and although the act of incorporation did not require its being paved every where, the company has judiciously carried the paving over the whole length of it.

I remarked in those places where the road was repairing, that much smaller stones than heretofore were spread upon it. In thus gradually correcting a defect observable in almost every turnpike, the company shew that they understand their true interest, and are disposed to profit by their own experience in the farther prosecution of their undertaking.

That in order to make a firm and smooth road, the stones used should not be bigger than about the size of a hen's egg, is a fact which the company seem to be aware of; and there is reason to expect, that they will make the new section of the road more smooth than the part already completed, and gradually improve this latter, as they have begun to do this spring. Such a plan will certainly prove cheaper in the end, and secure a considerable increase of tolls.

The shape given to a road previous to its being paved is, at least, of as much importance to its convenience and preservation, as the paving of it; but unfortunately this subject is seldom supposed to be attended with as much difficulty as it actually possesses: hence, the small number of well located and well shaped roads.

In the present turnpike I observed that a plan had been pursued at the beginning, whose error the company soon perceived and avoided in the subsequent part of their road. Much care was taken at first to raise the middle of the road on a bed of earth two or three feet in height; the consequence of this method was, that the pavement and slopes in the sides were soon destroyed, whereby the pavement was gradually diminished in width, and that the summer road became the receptacle of all the rain falling on the adjacent ground, and was actually converted into a mere ditch. The pavement, on the contrary, ought not to be more than a few inches higher in the middle than the summer roads, and every practicable way should be used to facilitate the escape of water towards the extremities of these latter into ditches or culverts properly contrived for this purpose; a transversal slope of the summer roads of 1 by 12 is the most eligible in strong soils, and 1 by 20 in sandy grounds, to accomplish this object.

I would recommend to correct gradually this defect, by filling the summer roads from ditches made outside of them. This will soon be found to be an economical expense; and as the company have avoided this defect after the first 5 or 6 miles, they will probably be convinced of the advantage of rectifying it where it exists.

After having carefully surveyed and examined the different routes between Buckland and Warrenton, during which examination, as well as during that of the completed road, I was accompanied by the treasurer of the company, Major J. Morgan, I recommended the route by way of New Baltimore and leading to the court-house about the middle of the town, as less mountainous, and very likely to prove cheaper and otherwise more advantageous to the company.

It appears to me of much importance to complete this last section as soon as possible, and I might also add the intended road from Warrenton to Thornton's Gap, as the proportion of tolls must certainly be much increased in each section, in proportion as the line is extended towards the heart of the State.

LITTLE RIVER TURNPIKE.

Pursuant to a standing order relative to works wherein the Board of Public Works is concerned, I have to remark, that in travelling over this turnpike I observed that it was repaired in some places with too large stones, and in others merely with earth containing a small proportion of gravel; both of which are ill calculated to make a road firm and smooth.

I have the honor to be, respectfully,

Your most obedient servant,

C. CROZET, *P. Eng'r.*

REPORT

OF THE

ENGINEERS AND COMMISSIONERS

Appointed for the Survey and Examination of James and Jackson's Rivers.

The board of engineers and commissioners, constituted by an act of the General Assembly "authorising a loan for the purposes of internal improvement," passed the 8th of March, 1824, respectfully report:

The duties enjoined upon the engineers and commissioners are,

1st. To make, with the utmost practicable care and accuracy, a new survey of the James and Jackson's rivers, with estimates of the probable cost of making the best practicable and most expedient improvement from the Maiden's Adventure falls to the mouth of Dunlap's creek.

2nd. To review and examine carefully the improvements on James river, made or in progress; to inquire whether such improvements have been judiciously laid out; whether the work has been well executed, and at reasonable prices.

3rd. And whether any useful alterations may be made "in the said improvements," and at what expense.

On the 19th of May, the assistant engineers, Messrs. Wilson, M. C. Fairfax and John H. Cocke, jr. pursuant to instructions from the principal engineer, set out from Richmond for the Blue Ridge, (having first employed a boat and hands,) where, on the 4th of June, they employed the necessary assistants, and commenced the survey at the Irish falls, and proceeded downwards until the 7th, when, in consequence of some imperfection in one of the instruments, and the absence of the principal engineer, the survey was suspended and the boat and hands were retained until the 25th of June, when an experimental line was commenced at Maiden's Adventure falls. By previous appointment of the engineer of this State, the commissioners met with him on the 5th of July at the house of Mrs. Tinsley, in Goochland county, and proceeded on the 6th to the line of survey then in progress, and at Mr. Tarlton Fleming's in Goochland county. (In the mean time it had been ascertained that Richard N. Venable, esq. one of the commissioners, had declined his appointment; but it was the opinion of the members ex-officio, that a majority of the commissioners, together with the engineers, might constitute a board.) The experimental survey was thence continued under the direction of the principal engineer throughout. The commissioners in the mean time progressed along the line of survey, exploring the ravine of the river and making inquiries relative to its navigable character and susceptibility of improvement. In the early part of August, the principal engineer thought it expedient to remove the survey from the mouth of Tye river, in the county of Nelson, to the other side of the Blue Ridge, in consequence of the near approach of the sickly season, and the difficulty of progressing through the high corn on the river bottom below the mountain. On the 16th of August the survey was again resumed, commencing at the mouth of North river, on the western side of the Blue Ridge, and was continued up the James and Jackson's rivers to the town of Covington, at the mouth of Dunlap's creek, where the party arrived about the first of October, and was employed in its vicinity, making examinations and awaiting the arrival of Judge Wright, the engineer expected from New-York, until the 10th or 11th, when they descended the river and commenced the section between the Blue Ridge and the mouth of Tye river, about the 20th, and arrived within 4 or 5 miles of Lynchburg on the 30th of October, when the survey was broken up by the principal engineer in consequence of a communication received by him from Judge Wright. The engineer and commissioners forthwith proceeded to Richmond, in order to make out some reports of their proceedings; and on their arrival there, were informed that the engineer from New-York was daily expected. On the 9th of November he arrived, and so soon as a communication of his arrival was made to the ex-officio directors, the engineers and commissioners organized themselves as a board, and determined, that in consequence of the advanced state of the season, it would not be advisable to resume the survey again until the next season, but that it would be most expedient to proceed to the execution of the duties stated in the second enumeration in the commencement of this report, viz: "To review and examine carefully the improvements on James river, made or in progress; to inquire whether such improvements have been judiciously laid out, and whether the work has been well executed, and at reasonable prices."

As it relates to this difficult and unpleasant duty assigned to the board of engineers and commissioners, they beg leave to state, that they have examined as carefully the improvements on the river, as time and circumstances at this advanced state of the season would permit, and are of opinion as it relates to the improvements under the direction and superintendance of the commissioner of the James and Jackson's river canal, that so far as can now be discovered, there has been pretty good judgment exercised on the part of the commissioner and his engineer, in the *location* of his part of the improvement, extending from the upper arch, (at about 7 miles from Richmond) to the Maiden's Adventure falls. In expressing this opinion, it is taken into consideration, that a connexion with the coal trade on the south side of James river, had a very important bearing in the location. Some small deviations from the present construction with a view to economy, might have been judiciously made, but upon a review of the whole subject of *location*, much praise is due. The board, however, are of opinion, that considerable saving might have been made in some parts of the work by substituting a different improvement for the heavy perpendicular walls along the margin of the river, and greater permanency given to the work. The work on the line appears to be generally well done; nay, some of the fine masonry in its construction and workmanship, may be considered as a work of supererogation, exhibiting a greater display of taste than of sound economy. As it relates to the prices of the work, many causes and circumstances which influenced the commissioner in his disbursements, are not now apparent upon a superficial view of the work in its present state; and consequently erroneous impressions might easily be imbibed as to the value of it. In cases however, where the different denominations of work have been contracted for by measurement, the board is of the opinion, that with some exceptions, the prices may be considered as reasonable. The improvement in progress under the direction of the commissioner of the Kanawha road and navigation extending from the lower end of the Irish falls through the Blue Ridge, to the mouth of the North river, is at *present* judiciously located. Some diversity of opinion has heretofore existed relative to this part of the commissioner's duty; but a majority of this board, considering the law as being imperative, are of opinion, that he was *bound* to construct the *canal* as high up as the *mouth of the North river.* The work, so far as it has been executed, is well done. The board, however, with a view to economy, would advise a change to be made in the manner of constructing some of the more expensive parts of this work, which it is presumed, can be yet judiciously done without injustice to the contractors, the commissioner having with much propriety reserved in his contracts the right of changing them. Taking this and other considerations into view, the board are of opinion, that the prices with some exceptions, may be considered as reasonable.

In relation to the width of the locks on this part of the improvement, the board, at the request of the commissioners, have deliberated on that subject; and considering that the trade now carried on, is confined to boats of small size, about 40 feet in length, and 7 1-2 in breadth; and that it may be many years before the whole improvement is completed; and that until it is so completed, such boats will be mostly, if not exclusively used; and considering also the great advantage of passing two boats at one time, during the existence of the present state of the boats employed in the river, and the facility of contracting the width of the locks, when a change in size and construction of the boats shall render it necessary to do so, a majority of the board beg leave to recommend locks 16 feet wide, as best suited to the present circumstances of the trade, and, more especially, if there should be an enlargement of the canal at a future day.

The third enumeration of duties required of the engineers and commissioners, is, to say, "whether any useful alterations may be made in the said improvements, and at what expense?" It is to be regretted, exceedingly, that the early and hapless location of the canal and locks from the lower arch to the dock in the city of Richmond, should have been made by the James river company; but an apology is readily found for the error, when it is considered how little was known of the erection of locks and other structures at the early day that this work was done, and the great advantage of avoiding any land carriage not fully appreciated. But the increase of business, connected with the transportation on James river, and its waters, now renders a remedy for this evil deserving the most serious consideration, because it taxes, unnecessarily, nearly every article brought down the James river; and when we add the fact, that the most considerable portion of the tonnage carried upon a canal, consists of articles of great bulk, and little value, (which must be brought to market at the least possible expense, if brought at all,) we are clearly of opinion, that this connection between the canal and the dock ought to be made by permanent locks, located at least 200 feet from each other, or by a double flight of locks upon the site of the old ones, so constructed as to cause little or no unnecessary detention of boats in their passage up and down. The advantages which would result from this connexion, are so obvious, that a further elucidation is deemed unnecessary. The probable estimate of expense necessary to effect such an alteration, this board, at this time, is unable to give; which must remain as an unfinished part of their duties until the next season.

This board would, with due deference, suggest, that the Legislature, in making up any opinion as to the propriety of further prosecuting this improvement by a continued canal, will find it a very erroneous and fallacious datum to take the average cost of that part of the line of canal (now nearly completed,) from the upper arch to the Maiden's Adventure falls, or, that section now in progress in the Blue Ridge mountain, for the following reasons: In that section from the upper arch to the Maiden's Adventure falls, there are two very expensive dams, and six guard-locks, exclusive of lift-locks. There are also other expenses on this section which will probably not occur on the other parts of the line. The section now in progress at the Blue Ridge mountain (of about six miles,) contains difficulties and natural obstructions to encounter and overcome, that will greatly exceed the average cost of the same distance on the whole line: indeed, there can be no section of the same distance on the line that will bear any kind of comparison with the obstructions on the margin of this stupendous cataract through the mountain. Moreover, it is a fact well known, that all improvements of this kind are more expensive in their incipient state than they are afterwards, when experience and a knowledge of the fair value of labor will bring with it more competition, and more energetic contractors. As an instance, a member of this board can confidently state, that the masonry of the first nine locks on the middle section of the Erie canal, in the State of New York, cost as much per perch for the simple operation of cutting and laying up the stone, as other locks (equally as well executed) cost per perch for the masonry, including the quarrying and hauling of the stone. Again; the contracts for excavation and embankment made the first year on the Erie canal, were, on an average, from 25 to 30 per cent. higher than those made subsequent to that time. And it is a fact well established, that the same contractor, after acquiring experience, can execute his job of work in the same proportion cheaper, than when he first engages without experience.

The board of engineers and commissioners lament exceedingly, that the survey and examination could not progress sufficiently to enable them to exhibit, through your board, to the present General Assembly, such a report as was contemplated by the law, and as the great and weighty importance of the subject demands. Indeed, one season does not afford sufficient time to effect so laborious, responsible, and important a duty; a duty, in short, imperiously demanding that every item of expense should be estimated with the utmost practicable care and accuracy, mile by mile, with full, clear and ample descriptions on all important and difficult points, and so elucidated and explained as to enable every member of the Legislature to test, in some good degree, its correctness. This particularity may to some appear unnecessary; but this board is fully impressed with its importance, and feel a strong desire to present the estimates of expense to the Board of Public Works and the Legislature, in a fair and just light, neither concealing, nor enlarging upon the cost. Further operations are suspended until the next season.

Very respectfully submitted.

BENJAMIN WRIGHT } *Engineers.*

GEO. LOVE,
PHIL. R. THOMPSON, } *Comm'rs.*

Richmond, December 13, 1824.

Inasmuch as I do not concur with the majority of the board, in some parts of the above report, I beg leave to refer the Board of Public Works to the special reports which are required of me by law.

C. CROZET, *Principal Eng'r.*

LETTER OF THE PRINCIPAL ENGINEER.

Lynchburg, October 24, 1824.

Sir,

I herein transmit to your excellency a letter I have just received from Judge Wright, from which some serious misfortune must be apprehended, as no other letter has followed this.

Under such circumstances I doubt whether I ought to continue the survey, especially as the season is so far advanced that, even should Judge Wright come now, the object of the law could not be accomplished this year. I therefore think, that it will be expedient to complete our operations as far down as Lynchburg, and then revise, on our way to Richmond, those places which have not been thoroughly examined. The survey, as far as it has progressed, is more than sufficient to occupy us during the winter, and the completion of it would not leave us time to prepare any report for the meeting of the Assembly. This will leave forty miles unsurveyed.

If the Board did not give their approbation to this course, I would respectfully request them to send me their orders to this place, in the vicinity of which I shall remain eight or ten days.

I have the honor to be, very respectfully,
Your most obedient servant,
C. CROZET, *P. E.*

His Excellency James Pleasants,
Governor of Virginia.

Philadelphia, September 26, 1824.

Dear Sir,

Your favor of 28th August must have travelled out of its road, as it was only within the last week that it reached me.

I can only say to you, that I have tarried too long near the marshes of Delaware, and have become infected with their nal fevers. My attack does not appear severe, and I w moving north into New York for a change of air, and in hopes to regain my usual health. In the course of a few days I shall write you again, if my health returns; if not, then you will not hear from me.

It has been said by some of my friends, and more particularly by a gentleman of the army in Richmond, who is an old acquaintance, that I ought not to venture into the valley of James river until the latter part of October, or some pretty severe frosts have destroyed the miasma of the vallies of Virginia. I can write no more; my health is too feeble.

With much respect,
I am, dear sir,
Your obedient servant,
BENJ. WRIGHT.

Capt. C. Crozet

Resolution of the James River Company, in relation to the application of the Board of Public Works for the premium on the $400,000 loan.

At a meeting of the James River Company, on Friday the 9th day of July, 1824:—The second Auditor stated to the Board, that he was instructed by the Board of Public Works, at a called meeting held by them in May last, to apply, as their secretary, to the James River Company, for the amount of the premium on the loan of $400,000, contracted for by the said company. On consideration whereof, the following resolution, (which the Second Auditor is requested to communicate to the Board of Public Works, at its next meeting) was adopted:

Resolved, That, however equitable the right of the Board of Public Works to the said premium may be, this board, not being apprised of any law by which their claim is authorised, must decline a compliance with their application.

A true extract from the minutes of the Board.

Teste,

J. BROWN, Jr. *Clerk pro tem.*

RETURNS AND REPORTS

OF

ROAD AND NAVIGATION COMPANIES.

UPPER APPOMATTOX COMPANY.

The annexed papers (A. B. and C.) shew the present state of the affairs of the Appomattox Company.

The debts now due from the company are almost wholly due to the Bank of Virginia, or the Commonwealth, for money borrowed before the establishment of the fund for internal improvement. The debt due the Bank when this statement was made, amounted to three thousand dollars; since which, it has been reduced to fifteen hundred. The principal of the debt due to the Commonwealth, is four thousand nine hundred and ninety dollars; interest $4,539 69; amounting to $9,529 69.

Through you, we beg leave to express our thanks to the General Assembly, for the loan of this money, and for the indulgence which has been given us in the re-payment.

We have, for several years past, for the want of funds, stopped the progress of our works, and applied the nett income of the company to the payment of their debts. We propose, in the ensuing year, first to discharge the balance of the debt due to the Bank; and then to apply our income to the discharge of the debt due the Commonwealth, before we progress much farther with our works, or make any dividend among the stockholders. Perhaps it might be well to permit us to lay additional toll on some articles, and apply the proceeds to the improvement of the navigation.

The people of this section of country have it in contemplation to connect the waters of Roanoke and Appomattox; and we believe the work will be effected. This, together with the increasing commerce of these rivers, renders it proper for us to make every exertion in our power to improve the navigation of Appomattox.

Would the state take two-fifths of our stock, as in other companies, it would give a considerable spur to our present efforts, even though it should not in the end afford any advantage to the stockholders. We solicit of you, therefore, that you would recommend to the General Assembly to authorise the Board of Public Works to subscribe in the Upper Appomattox company on the same terms as in other companies, two-fifths of the stock of the said company.

We once thought the system of internal improvement would be beneficial to this part of the country, and were amongst its strongest advocates. Its progress for eight years past, has been to tax us, and involve us in debt, without receiving aid to the amount of one single cent. We are carefully charged with all the expense of exploring and investigating the country. We observe that Petersburg, after paying a considerable sum, is charged with a little balance of this kind. We have given some evidence of our patience in conducting the work which we have under our charge. We hope you will not turn aside from these remarks without consideration, from an impression that we are disposed to complain.

We are gentlemen, your obedient servants,

THO'S A. MORTON,
RICH'D N. VENABLE,
NATH'L E. VENABLE,
JAMES MADISON, } *Superintendants.*

To the President and Directors of the
Board of Public Works.

[A.]

UPPER APPOMATTOX COMPANY.

Return of the state of the Upper Appomattox Company, on the first day of September, 1824.

Capital subscribed,		$61,100 00
Aggregate of requisitions made on stockholders,		61,100 00
Amount paid by stockholders,		61,048 58
Amount due by individual stockholders,		51 42
Amount due by the Board of Public Works,		
Capital expended in the work,		86,789 61
Tolls received from the 1st September, 1823, to 1st September, 1824, (see paper marked B.)		3,474 94
Lease of water due for the same period,		2,000 00
Sum expended in improvements and repairs, (see item of expenses below, and paper marked C.)		
Officers' salaries and expenses of collecting tolls,		600 00
All other expenses and for what, (see paper marked C.)		593 97
Balance of money in hand,		105 74
Debts due by the company,	$8,610 18	
Interest on said debts,	4,568 01	
		13,178 19
Debts due to the company,	$17,149 57	
Interest on said debts,	867 40	
		18,016 97

S. D. MORTON,

Clerk U. A. Company.

[B.]

Statement shewing the amount of tolls received by the Upper Appomattox Company, for one year, ending 31*st of August,* 1824, *and the articles on which the toll was paid.*

10,795	barrels of flour,	*produced in tolls* $ 3,474 94
40,519	bushels of wheat,	
3,134	hhds. of tobacco,	
53	bushels of corn,	
4,676	" salt,	
435,225	lbs. goods,	
341	tierces of lime,	
15	loads of wood,	
2	empty boats,	
50	bushels of coal,	

N. B.—During a part of the months of June and July, there was a breach in the canal, and boats could not descend lower than the locks; therefore, only half toll was charged.

S. D. MORTON,
Clerk U. A. Company.

[C.]

Account of the general expenses of the Upper Appomattox Company, for the year ending 31*st August,* 1824.

Boatage, sawing and removing timber for lock-gate,	$ 13 12	
Making lock-gate, and furnishing part of timber,	153 00	
Making waste-gate,	3 50	
Slabs to cover gate-timbers,	19 00	
		188 62
Amount carried forward,		188 62

Amount brought forward,		$188 62
Hand hire, clearing out and mending canal, &c.	$55 50	
Hoes and wheel-barrows, $19; smith's works, $9 92; nails and tar, 60 cents,	29 52	
Superintendent of hands,	7 00	
		92 02
Paper and books, $1; postages, &c. $1; clerk hire, $15,	17 00	
Advertising, $11 25; horse hire sundry times, $17,	28 25	
		45 25
Lawyers and witness's fees in suit *vs.* Bannister and Stokes and Smith,		61 96
Corn, meal, bacon, pork, salt, spirits, wood, clothes, shoes and stockings, hats, doctor's bills, medicine, &c. for hands,		206 12
(E. E.)		$593 97

Petersburg, September 1, 1824.

CARTERSVILLE BRIDGE COMPANY.

Return of the state of the Cartersville Bridge Company, on the 26th day of November, 1824.

Capital subscribed, as stated in the last report,	$22,600 00
Aggregate of requistions made on stockholders,	17,600 00
Amount paid by stockholders,	17,600 00
Amount paid by Board of Public Works,	5,000 00
Capital expended in the work,	24,100 00
Carried forward,	

Brought forward,		
Tolls received from the 26th of November, 1823, to the 26th day of November, 1824, as per treasurer's account enclosed,		546 23
Sum expended out of tolls in paying debts, improvements and repairs, as per treasurer's account in detail,		592 00
Officers' salaries and expenses of collecting tolls, viz:		
$50 to treasurer and $75 to toll-gatherer,		125 00
Balance against the company, as per treasurer's account,		6 94
Debts due by the company, viz:		
To Va. Bank, &c.	$1,200 00	
Debts due to the company by other than stockholders, on the 1st Jauuary, 1825,	353 00	
Nett debt due by the company,		847 00

THOS. MILLER,
President of C. B. Company.

Cartersville, Nov. 26, 1824.

N. B. It may be proper to remark, that during the late summer, the middle arch of the bridge appeared to have given way, and swagged a little. This rendered it necessary to strip that part of the bridge for the purpose of examining the extent and nature of the injury. It was found to be very inconsiderable, and a few braces were sufficient to remedy the evil. This circumstance, however, will mainly account for the expenditures in repairs during the present year.

T. MILLER, *President.*

DISMAL SWAMP CANAL COMPANY.

The annual report of the President and Directors of the Dismal Swamp Canal Company.

NORFOLK, 30th November, 1824.

To the President and Directors of the Board of Public Works.

The memorial of this company, dated the 30th November, 1823, presented to the Board of Public Works, exhibited a detailed view of the operations, and a state of the affairs of the company, up to that period; with a view of contemplated operations for the year 1824.

As stated in the memorial, it was intended to have erected a double stone lock at the south out-fall, corresponding with that erected at the north out-fall. Subsequent reflection induced a change, and it was decided to erect two single locks, one at the south out-fall, and the other about a mile and a half north, and near the present wood lock, called "Spence's." By this change, a great expense will be saved in embankment; and will, it is believed, furnish additional security. In pursuance of this determination, materials of every description were collected for the lock last mentioned, considerable progress was made, when unexampled continued rains rendered it impossible to make any further progress than in putting down and securing the foundation, which is the most difficult and expensive part of the work. The last annual return of the state of the company shewed, that the funds of the company had been exhausted in the prosecution of the work to that date. To accomplish the completion of the canal, it became necessary to apply to your board for further aid; which, in the spirit of liberality heretofore exercised towards this company, was afforded by a loan of thirty-seven thousand five hundred dollars, payable by instalments, to commence on a future day. As this loan constituted the only fund by which the labors of the company could be prosecuted, with a view to save time, so important, in all respects, to the best interests of the company, and of the country through which the canal passes, and is connected; the directors deemed it expedient and indispensably necessary to borrow, in anticipation of the loan, the sum of ten thousand dollars; for the payment of which, that loan was pledged to one of the banks of this place. The amount borrowed, as well as the purposes to which it was applied, will appear by the return of the company. If the season is not very unfavorable, the directors entertain no doubt that, during the year 1825, both the contemplated locks will be completed. The navigation of the canal was unavoidably slightly interrupted. It had the effect of diminishing the amount of tolls on produce from North Carolina. The obstruction will be removed in a few days.

By acts of the legislatures of Virginia and North Carolina, (that of Virginia, passed 14th February, 1816,) this company was authorised to raise fifty thousand dollars, by way of lottery. Attempts were made, under the direction and superintendence of the directors, to raise a part of this sum; but resulting in loss, no further attempt was made. The directors have entered into a contract with persons of responsibility, whereby they have disposed of the privilege granted, for fifty thousand dollars, payable by instalments, the first to commence the first of October, 1826.

The accompanying documents exhibit a state of the receipts and expenditures for the year 1824.

JOHN COWPER,
GEORGE M'INTOSH,
JOHN TABB,
JOHN TUNIS,
} *Directors.*

The President and Directors of the
Board of Public Works.

Return of the state of the Dismal Swamp Canal Company, on the 30th Nov. 1824.

Capital stock subscribed and paid by stockholders,		$160,000
Amount due by the Board of Public Works—*nothing.*		
Capital expended in the work: say,		
Amount of account of general expenditures,	$350,552 58	
Amount of stone lock account,	79,135 61	
Amount of discount account,	20,323 47	
Amount of contingent expenses account,	190 45	
Amount of interest account,	3,473 80	
Amount of personal estate,	73 00	
		453,748 91
Tolls received up to the 1st Dec. 1823,	$107,853 31	
do. do. from that to this time,	7,716 97	
		115,570 28
Officers' salaries, &c. viz:		
M. Parks, superintendant and engineer, a year,	$1,200	
Garrett, overseer of workmen,	360	
Carr, toll keeper,	360	
Two lock keepers, each $144,	288	
A. Ferret, accountant,		2,208 00
Dividends declared—none at any time.		
Balance of money on hand, at Farmers' Bank,		530 63
Debts due by the company, viz:		
To the Board of Public Works,	$ 50,000 00	
To the Banks 50,000 on stock, 10,000 on loan, the rest on individual security,	118,500 00	
M. Parks,	58[illegible]	
Sundry accounts, &c.	17,5[illegible]	
Carried forward,		[illegible]610 01

Brought forward,	
Debts due to the company, otherwise than on account of stock,	7,900 75

JOHN COWPER,
GEORGE M'INTOSH,
JOHN TABB, } *Directors.*

Norfolk, November 30th, 1824.

◆

FAIRFAX TURNPIKE COMPANY.

WASHINGTON, 27th November, 1824.

SIR,

In compliance with the request of your circular of the 11th of October, I transmit the following information, with the additional fact, that the Fairfax turnpike is just completed.

Return of the state of the Fairfax Turnpike Company, on the 27th November, 1824.

	Amounts.
Capital subscibed,	$13,750 00
Aggregate of requisitions made on stockholders,	8,350 00
Amount paid by stockholders,	8,300 00
Amount due by the Board of Public Works,*	4,500 00
Amount due by individual stockholders,	50 00
Capital expended in the work,	12,131 01
Tolls received,	00 00
Sums expended out of the tolls in improvements and repairs,	00 00
Officers' salaries and expenses of collecting tolls, (in detail,)	00 00
Carried forward,	

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* This is presumed; the whole subscription of the State having been anticipated by being discounted, and orders given to the bank discounting, on the Board of Public Works.

Brought forward,	
All other expenses and for what, (discount on subscription of Virginia,)	441 00
Dividends declared and when,	00 00
Balance of money in hand,	1,109 63
Debts due by the company,	629 00
Debts due to the company other than from stockholders,	00 00

By direction of the Board of Directors,

JOHN H. REILY, *Treasurer.*

J. Brown, Jr. *2d Auditor of Public Works.*

FAUQUIER & ALEXANDRIA TURNPIKE COMPANY.

Alexandria, 30th November, 1824.

Sir,

Agreeably to the request contained in your letter of the 11th October last, I transmit you herewith enclosed a statement of the affairs of the Fauquier and Alexandria Turnpike Company up to 31st October, 1824; and am

Very respectfully, sir, your obedient servant,

J. MORGAN, *Tr.*

J. Brown, Jr. *Sec'ry of the Board of Public Works.*

Return of the state of the Fauquier and Alexandria Turnpike Company, to the 31st October, 1824.

Amount of capital stock subscribed,	$70,600 00	
Of which has been forfeited according to law,	18,300 00	
Carried forward,		$52,300 00

Brought forward,		
Amount subscribed by Board of Public Works,		30,000 00
Amount of payments made by individuals,		62,651 00
Amount of payments made by Board of Public Works,		7,500 00
Amount due by Board of Public Works,		22,500 00
Amount due by individual stockholders,		7,549 00
Amount of capital expended on the road,		79,526 93
Amount of tolls received viz:		
From 1st January to 31st December, 1819,	1,955 85	
From 1st January to 31st December, 1820,	2,233 29	
From 1st January to 31st December, 1821,	1,502 90	
From 1st January to 31st December, 1822,	1,905 17	
From 1st January to 31st December, 1823,	1,414 28	
From 1st January to 31st October, 1824,	1,148 64	
		10,160 13
Amount expended on improvements and repairs out of tolls, including officers' salaries,		10,160 13
Amount of officers' salaries, viz:		
3 toll-keepers at $140 per annum,	420 00	
1 superintendant, $150,	150 00	
Treasurer,	250 00	
		820 00
Other expenses, and for what, nothing.		
Dividends: None declared.		
Amount of money on hand,		320 00
Amount of debts due by the company,		9,875 93
Amount of debts due the company other than from stockholders: Nothing.		

It is contemplated that the whole route of the Fauquier and Alexandria turnpike road will be completed by the 1st day of January 1827; contracts having been made to finish the balance of it by that time, which will then embrace a distance of upwards of twenty-eight miles, from Fauquier court-house to Buckland, and the Little River turnpike road in Fairfax county.

In consequence of the whole route of this road not being finished, the board of directors have thought proper, as yet, to require the payment of only half the tolls authorised by law to be demanded, which will account for the small amount of tolls received. When the road is completed, full tolls will be exacted.

The company are now engaged in making the balance of the road authorised by law to be paved, to wit, from Fauquier court-house to Buckland, upon a new and highly approved principle, called McAdam's plan; which, being the first of the kind, will perhaps be the best road in Virginia.

All of which is respectfully submitted.

J. MORGAN, *Tr.*

FALLSBRIDGE TURNPIKE COMPANY.

Return of the state of the Fallsbridge Turnpike Company, on the 6th day of December, 1824.

Capital subscribed,	$80,521	40
Aggregate of requisitions made on stockholders,	64,521	40
Amount paid by stockholders,	60,269	42
Amount due by the Board of Public Works,	8,000	00
Amount due by individual stockholders,	4,251	98
Capital expended in the work,	76,116	29
Carried forward,		

Brought forward,		
Tolls received from 1st December, 1823, to 4th December, 1824,		974 79
Sums expended out of the tolls, in improvements and repairs,		692 25
Officers' salaries and expenses of collecting tolls:		
Treasurer, per annum,	$100 00	
Toll-keeper, do.	100 00	
		200 00
All other expenses, and for what:		
Collecting tolls, printing, &c.		314 11
Dividends declared, and when,		none.
Balance of money in hand,		68 43
Debts due by the company,		21,513 45
Debts due to the company, other than from stockholders,		none.

Sir—Above is a statement of the affairs of the Fallsbridge turnpike company. There is an unsettled balance due one of the contractors, as mentioned in former report, in addition to the $21,513 45, which still remains unsettled.

Very respectfully,
JOHN LYONS, *Director*, (the President being absent.)
To J. Brown, Jr. *Secretary to the Board of Public Works, Virginia.*

LEESBURG TURNPIKE COMPANY.

Leesburg, December 1, 1824.

To J. Brown, Jr.

Sir,

Enclosed you will receive a statement of the Leesburg T. P. road up to this day.

I am, sir, very respectfully,
Your obedient servant,
THOS. R. MOTT,
Treasurer L. T. P. R. Company.

Return of the state of the Leesburg Turnpike Road Company, on the 1st day of December, 1824.

Capital subscribed,		$84,000 00
Aggregate of requisitions made on stockholders,		50,400 00
Amount due by the Board of Public Works,		nothing.
Amount due by individual stockholders,		2,911 24
Capital expended in the work,		the whole.
Tolls received from the 1st July, 1823, to 1st July, 1824,		3,359 92
Expended out of the toll in improvements and repairs,		1,324 06
Officers' salaries and expenses of collecting tolls, viz:		
Salary of president,	$100 00	
Do. of four directors, at $25 each,	100 00	
Treasurer's commissions for receiving and paying,	63 95	
Two toll-gatherers, $150 each,	300 00	
Fuel for do.	20 42	
		584 37
All other expenses, viz:		
To cash paid for printing,	$13 00	
" attorney,	40 00	
" clerk's fees,	49 31	
Interest on $4,000 to the Br. Bank at Leesburg, from 22d August, 1823, to 2d July, 1824,	213 35	
		315 66
Balance of toll-money on hand,		none.
Debts due by the company, viz:		
To the Br. Bank at Leesburg,	$4,000 00	
To John McAlier & Co. for making road,	309 82	
To Js. McKendrick & Co. for do.	213 34	

Carried forward,

Brought forward,	
Debts due to the company other than from stockholders,	nothing.
Amount paid by stockholders,	47,488 76
Dividend declared 1st July, 1824, being 2 1-2 per cent. on the amount paid in by individual stockholders, (per annum,)	$1,175 80

(E. E.)

THO. R. MOTT, *Treasurer.*

December 1, 1824.

LITTLE RIVER TURNPIKE COMPANY.

Alexandria, 12th month 4th, 1824.

James Brown, Jr.
Secretary of the Board of Public Works, Virginia.

I herewith hand to thee, the report of the president and directors of the Little River Turnpike Company, to the stockholders in said company, at their last annual meeting, which exhibits a full statement of their affairs at that time.

The stockholders at their last annual meeting, authorised the president and directors to make such dividend on the first day of the fourth month following, as the state of the funds of the company would admit of: in consequence of which order, the Board met at the time prescribed, and after examining the treasurer's account, ascertained there was a sufficient sum on hand for a dividend of two and an half dollars per share, which was accordingly ordered to be paid to the stockholders or to their legal representatives on the sixth day of the same month, (April,) which dividend, I presume, has been received some time since by the Board of Public Works or their agent.

Respectfully, thy friend,

PHINEAS JANNEY,
President of the Little River Turnpike Company.

The president and directors of the Little River turnpike company, respectfully report to the stockholders,

That the receipts for the year ending the 31st of December, 1823, amount to			$13,111 [illegible]8
For a fractional part of a share of stock issued,			6 34
On account of old balances,			179 15
Balance in the hands of the treasurer per his account for 1822,			5,195 82
To which is to be added $3,000, borrowed to assist in paying the amount due the state of Virginia by last report,			3,000 00
			$21,492 39
There has been expended in ordinary repairs by Jas. Lewis, superintendant of the upper district of road, including his salary of $400,		1,791 17	
And by Thos. Moss, superintendant of the lower district, including the building a good stone bridge of two arches, one of 24 and the other 12 feet span over Accotinck creek, and including his salary of $400 00,		3,352 93	
Payment of salary of all the gate-keepers,		1,550 00	
Salary of the president $200, and 4 directors $100 each,		600 00	
The treasurer's commission on $13,296 57 at 2 pr. ct.	$265 93		
Ditto, $3,000 at 1 pr. ct.	30 00		
		295	
Amounts carried forward,		$7,590	492 39

Amounts brought forward,	$7,590 03	$21,492 39
Treasurer's compensation allowed for expense of collecting from gate-keepers, &c. as fixed by stockholders in general meeting,	40 00	
Marshal's and clerk's fees, and printer's bills, postage and tax,	27 47½	
Expenses of stockholders at general meeting,	38 87½	
Paid treasurer of state of Virginia, balance due,	5,230 27	
Paid old account of Ed. Summers, Wm. Payne, and S. Ratcliffe,	129 15	
Paid Robt. Ratcliffe, balance for bridge at Cub run,	45 00	
Paid 2 counterfeit dollars received by gate-keepers,	2 00	
Paid on account of money borrowed,	2,081 50	
Dividends pr. treasurer's account,	6,200 34	
		21,384 64
Leaving a balance in the hands of the treasurer, as pr. his account, of		$107 75
There are also debts and property belonging to the company as pr. schedule exhibited by the treasurer, amounting to $2,063 71, of which we consider as good, only		847 67
		955 42
The company owes a balance of cash dividends uncalled for,	629 16	
Amounts carried forward,	$629 16	$955 42

Amounts brought forward,	$629 16	$955 42
And dividends payable in stock uncalled for, since 1810 and 1815,	380 52	
Thos. Fouch, for claim of commission on collecting money,	100 00	
The company also owes balance of money borrowed,	1,000 00	
		2,109 68
Shewing a deficit on 31st of December 1823, of		$1,154 26

The president and directors further report, that owing to the small quantity of produce brought to market in the year 1823, the tolls on the road amount to $3,326 67, less than was received the preceding year; whilst the expenditures have lessened only $596 55, owing principally to the unavoidable expense of building a bridge over Accotinck, agreeably to their suggestion of last year.

They would respectfully propose to the present meeting of stockholders, the propriety of authorising the president and directors that may be elected to manage the affairs of the company for the present year, to declare such dividend as the state of the funds of the company, in their opinion, may admit of on the first day of April next, payable to the stockholders or their legal representatives on the 5th of said month. All of which is submitted.

Signed,

PHINEAS JANNEY, *President.*

GEO. CARTER,
CHS. LEWIS,
REUBEN JOHNSTON,
ABIJAH JANNEY, } *Directors.*

Alexandria, 9*th of January,* 1824.

LYNCHBURG AND SALEM TURNPIKE COMPANY.

Return of the state of the Lynchburg and Salem Turnpike Company on the 29th day of September, 1824.

Capital subscribed, 739 shares, at $100 per share.	
Aggregate of requisitions made on stockholders, $75 per share.	
Amount paid by stockholders,	$52,255 05
Amount due by the Board of Public Works,	nothing.
Amount due by individual stockholders,	3,525 41
Capital expended in the work (or cash paid,)	48,138 94
Tolls received from the 12th day of December, 1821, to the 29th day of September, 1824, exclusive of change furnished the toll-gatherers at sundry times,	7,080 58
Sums expended out of the tolls, in improvements and repairs,	130 00
Officers' salaries and expenses of collecting tolls, viz:	
Clerk's salary, $25 per year;	
Treasurer's salary, one per cent on the money passing through his hands;	
Newby Johnson, toll-gatherer, salary $300 per year at present, formerly $350 per year;	
Wm. Thompson, do. do. $175 per year;	
Other expenses, viz:	
Discount paid in the Farmers' Bank, for money borrowed for the use of the company,	310 84
Damages paid for the road running through lands,	1,243 50
Paid lawyer's fees, clerks' and sheriffs' tickets, attendance of witnesses, auctioneers, &c.	669 12
Paid for printing,	162 50
Paid Wm. Davis, late president, by order of the general meeting, for his extraordinary services to the company,	500 00
Carried forward,	

Brought forward,	
Paid John Lynch, for his five shares of stock, per contract of the president and directors,	$250 00
Paid surveyors, chain carriers, &c and expenses of the president and directors attending the location of the road and other business of the company,	472 69
Five dividends have been declared, viz:	
1st on the 12th day of June, 1822, of $2 on each share,	
2d on the 12th day of Dec. 1822, of $1 on each share,	
3d on the 12th day of June, 1823, of $2 on each share,	
4th on the 12th day of Dec. 1823, of $1 on each share,	
5th on the 12th day of June, 1824, of $1 50 on each share.	
Balance of money in hand,	3,361 91
Debts due by the company may be estimated at about	12,000 00
Debts due to the company other than from stockholders, and principally from subscribers whose stock has all been sold,	6,311 25

JOHN LYNCH, *Treasurer*.

Wm. Davis, P. P. T.

MANCHESTER AND PETERSBURG TURNPIKE COMPANY.

Manchester, 1st December, 1824.

Sir,

The directors of the Manchester and Petersburg turnpike company have instructed me to transmit to you the following report, for the information of the Board of Public Works. The whole extent of the Manchester and Petersburg turnpike is twenty miles, divided according to the act of 13th February, 1816, into three equal sections.

Seven miles adjoining Manchester have been finished upwards of 18 months, and have borne travelling remarkably well. The only repairs upon this part of the road, have been the filling up of a few small holes, of the expense of which no separate account has been kept, the work being done by the company's labourers. It cannot be estimated at more than $10.

The bedding of the southern section is finished, with the exception of about two hundred yards near Swift creek, where some difficulties have arose in obtaining the land necessary; but these difficulties will not for a moment retard the operations of gravelling, and will in due time be removed. The bedding of the central section too, is in considerable forwardness; and though little of it has received a final completion, the whole forms a very good road, generally dry, firm and easily travelled.

For the purpose of insuring its good order during the winter, the labourers have been, for some weeks past, and will probably till Christmas, remain at work on this section. This course, although it somewhat postpones the gravelling on the southern section, will yet carry the middle section sooner afterwards to completion. On the northern section an acre of land has been purchased, the ground cleared and fenced, a comfortable house built for the toll-gatherer, and a well dug thereon.

In furnishing a concise view of the pecuniary affairs of the company, it is deemed advisable to predicate it on the state thereof, at the close of the present month, as their principal contracts fall to be performed at that time, and their situation may be so far anticipated without any risque of material error.

FIRST.

The amount of their capital stock subscribed, including that held by the Board of Public Works, is	$75,900 00
Aggregate of requisitions made on individual stockholders,	67,900 00
Carried forward,	

Brought forward,		
Amount paid by individual stockholders,	$61,668 00	
Amount that will soon be certainly collected from individual stockholders,	1,605 00	
		*63,273 00
Amount of tolls for the year 1824,		1,817 00

* The aggregate amount of payments made by stockholders, and what may further be expected,	$63,273 00
Subtracted from the whole amount of requisitions,	67,900 00
Leaves a deficit of,	$4,627 00

This loss is in consequence of a sale of stock held by persons who had become insolvent, made about 12 months ago, when the company's affairs wore a very gloomy aspect, but since which the price has greatly been advanced. Whether any part of this deficit will ever be received, is very uncertain.

SECOND.

The total amount of expenses incurred in carrying on the company's work from the commencement,	$69,818 00
Deduct amount of debts payable on or before the 31st December,	6,333 00
There remains the amount settled, received and paid away, including $1,817 tolls.	$63,485 00

THIRD.

Debts due the company:	
From the Board of Public Works,	$8,000 00
From sundry stockholders,	1,605 00
Amount carried forward,	$9,605 00

Amount brought forward,	$9,605 00
For tolls payable 31st December, 1824,	450 00
	$10,055 00
Deduct amount of debts,	6,333 00
Remains applicable to future operations,	$3,722 00

FOURTH.

Annual salaries of officers and agents:

To the senior overseer,	$225 00
" Junior overseer,	144 00
" 2d junior overseer, (when employed,)*	144 00
" Toll-keeper, (fire wood worth $25,)	300 00
" Clerk and accountant,	80 00

In the statement presented by the directors to the Board of Public Works about 12 months ago, they expressed an opinion that $20,000, in addition to the resources they then possessed, would enable them to finish the road without diminishing the force employed on it, and which they deemed it highly advantageous to keep up. Subsequent incidents and frequent reflections confirm them in the correctness of this opinion at the time it was formed. But, the great fall that has since taken place in the price of forage and provisions, creates a belief that their object could now be accomplished for less by $2,000, or even a greater difference. And they cannot help indulging the hope, that a further subscription of their stock by the Board of Public Works, may be procured during the present session of the Legislature.

From the experiment of the first year's toll, they trust it will be apparent too, that whatever funds the Commonwealth may adventure in this institution, will eventually prove a very advantageous investment.

I am, with great respect,
Your obedient servant,
JAMES HENDERSON, *President.*

(L. S.)

To the Secretary of the Board
of Public Works, Virginia.

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* A second junior overseer has only been employed during the present year; and for the ensuing year the directors have only employed one junior overseer. The overseers are found in the usual provisions by the company.

MONONGALIA NAVIGATION COMPANY.

Return of the state of the Monongalia Navigation Company, on the 18th day of Nov. 1824.

Capital subscribed,	$35,000 00
Aggregate amount of requisitions made on stockholders, 61 per cent.	21,350 00
Amount paid by stockholders,	19,618 00
Amount due by the Board of Public Works,	692 80
Amount due by individual stockholders,	1,039 20
Capital expended in the work,	18,918 00
Tolls received from the 15th November, 1823, to 18th November, 1824,	00 00
Sums expended out of tolls in improvements and repairs,	00 00
Officers' salaries and expenses of collecting tolls from the organization of the company the year 1824, *viz:*	
Allowances to directors,	483 00
" to treasurers,	60 00
" to clerks,	70 00
All other expenses and for what, no final settlement of them,	
Dividends declared and when,	00 00
Balance of money on hand,	00 00
Debts due by the company; not ascertained,	
Debts due to the company other than from stockholders:	
There is due and in the hands of the former treasurer,	671 00
Three seats were rented on the 18*th of October last, for* 20 *years, renewable forever at the rate of* $260 *per annum, viz:*	
Carried forward,	

Brought forward,	
Chapman's or No. 8, at	$100 00
Tichenal's or No. 7, at	80 00
Wood's or No. 6, at	80 00

WM. MARTIN, *President.*

Teste,

JONA. JACKSON, *Secretary of M. N. Company.*

POTOMAC COMPANY.

OFFICE OF POTOMAC COMPANY,
Georgetown, December 6, 1824.

SIR,

Under cover, I beg leave to hand you, for the use of the Board of Public Works of Virginia, and in the form prescribed by you in October, 1823, the information required, relative to the affairs of the Potomac company, as extracted from their books by the treasurer and clerk of the company.

With great respect, I am, sir,
Your most obedient servant,

J. MASON,
President Potomac Company.

J. BROWN, Jr. *Secretary to the Board of Public Works of Virginia.*

Return of the state of the Potomac Canal Company.

Capital subscribed,	$355,111 11
Aggregate of requisitions made on stockholders,	355,111 11
Carried forward,	

Brought forward,	
Amount due by individual stockholders,	$932 20
Amount due by the Board of Public Works,	00 00
Capital expended on the work,	336,551 10
Amount of tolls received from the 1st day of August, 1823, to the 1st day of August, 1824,	9,851 13
Sum expended out of the tolls, in repairs and improvements, officer's salaries, interest on loans, and other expenses,	231,582 61
Dividend declared 2d August, 1802,	3,890 00
Officer's salaries, and expenses of collecting tolls, per annum,	2,100 00
Amount of cash on hand,	1,236 81
Amount of debts due to the company, otherwise than on account of stock,	16,560 23
Amount of debts due by the company,	188,761 72

Note 1. For the apparent difference between the aggregate requisitions made on the stockholders, and the capital expended in the work, see note A. in the report to the Board of Public Works of December, 1822.

Note 2. The sum actually expended in the work is larger than that shewn under the head of capital expended, by the amount of tolls and loans disbursed in the same. See note on this subject, in the report of December, 1823.

J. MOORE, Jr.

Treasurer Potomac Company.

RICHMOND DOCK COMPANY.

RICHMOND, December 7, 1824.

J BROWN, Jr. *Sec'y to the Board of Public Works.*

SIR,

Since the last annual report of the directors of the Richmond dock company, the operations of the company have been conducted on a scale more limited than at any period since their charter was obtained. The want of resources has precluded the directors from employing, during the last year, means more proportioned to their ends; and, in the progress of their works, they have encountered obstacles both moral and physical, to an extent which was not to have been anticipated. The prejudices, very honestly entertained by many, against a work (admitted by all to be of great importance,) whose completion they deemed impracticable, and the active hostility of others whose interests are to be affected in an inverse ratio of the public benefit accruing from the success of this great work, have tended to avert that patronage from the dock to which its advanced stage of completion, and consequent capacity to be useful, has entitled it. Difficulties, therefore, have had a protracted existence, by cutting off resources which, if obtained, would have been applied to their speedy removal. In despite, however, of the above discouraging circumstances, the company has succeeded, during the past summer, in affording a very considerable accommodation in the dock to the various descriptions of vessels employed in the trade of this city. Their labor, for some months, has been employed in excavating the canal between 18th street and their lock at Rocketts: and the navigation between those two points is adapted to vessels drawing nine feet water. For the present, the water is excluded from the dock to repair the locks which connect the basin of the James river company with the dock, and to close permanently the opening in their embankment opposite to 18th street, left for the egress of small boats, which experience has proven to be useless; and which, if permitted to exist, would hereafter cause great injury to the dock. These objects, it is probable, will be effected in the next ten days, when the water will be re-admitted, and the labors of the company will be again directed, without further intermission, to its excavation.

The directors confidently hope, that the next summer will enable them to give as perfect a navigation to the city as was ever contemplated by their charter. The report of the treasurer, herewith communicated, exhibits the state of the finances of the company. The receipts from the tolls of the dock, though partial, afford evidence, that when it shall be in a condition to embrace the general trade of the city, the directors will be enabled to re-pay, without difficulty, the loan heretofore made by the state, and any other that the fostering hand of the Legislature may authorise at its present session. It should be borne in mind, that the amount of tolls received has been charged at something less than one-half the rates allowed under the charter of the company. The policy of such temporary reduction will be evident to every one acquainted with the competition between the owners of the wharves at Rocketts and the dock. But, the great superiority of the latter over the former, in convenience, security, and economy, to the shipping interest, which is daily developing, must triumph; and the success of the Richmond dock company, in accomplishing the object for which it was incorporated, will be as signal, and as certain, as its friends could desire, or its enemies could deprecate.

Respectfully,

J. B. HARVIE,

President Richmond Dock Company.

Return of the state of the Richmond Dock Company, on the 6th December, 1824.

Capital subscribed,	$250,000 00
Aggregate of requisitions made on stockholders,	250,000 00
Amount paid by stockholders,	245,384 07
Amount due by the Board of Public Works,	00 00
Amount due by individual stockholders, $3,567 25, in suit in superior court of chancery for the Richmond district; and $176 and $873 68, as heretofore reported,	4,615 93
Carried forward,	

Brought forward,	
*Capital expended in the work,	$ 322,265 42
Tolls received from 30th November, 1823, to 30th November, 1824. (The whole amount that accrued during the period, was $5,384 88; of which, $36 54 is uncollected,)	5,348 34
Sums expended out of the tolls, in repairs and improvements. All the tolls received were applied, in common with other funds, to the uses of the company,	
Officers' salaries and expenses of collecting tolls, (in detail:)	
Superintendant $1,000; collector $750; clerk and treasurer, $500; lock-keeper, $250 per annum,	2,500 00
All other expenses, and for what; same as last reported.	
Dividends declared and when; ditto.	
*Debts due by the company, other than the loan from the Board of Public Works,	38,935 08
Debts due to the company, otherwise than on account of stock,	516 50

(E. E.)

H. BAKER,
Treasurer of the Richmond Dock Company.

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* The negro hire for the current year, falling due in January, is included.

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ROANOKE NAVIGATION COMPANY.

Halifax, N. C. November, 25th, 1824.

Sir,

I enclose, for the information of the Board of Public Works of Virginia, a copy of the annual report of the superintendants of the works of the Roanoke navigation company, (A)—a copy of the annual report of the treasurer of the said company, (B)—and a return of the state of the same company on the 6th instant, (C.)

The reports of the superintendants and that of the treasurer, constitute a part of the annual report of the directors, and embrace all the information it affords on the subject of the works and funds of the company. The residue of their report is a mere expression of their views on the propriety of effecting a lockage at Weldon, between the basin and the river below; the Board of Internal Improvement of North Carolina having offered to subscribe $25,000 to the stock of the company, on condition that it should be exclusively applied to that object. This part of the report the stockholders ordered to be printed; it is now in the press, and as soon as it comes out, which will be in a very few days, I shall forward it to you.

I am, &c. &c.

CAD. JONES,
President R. N. C.

To the Secretary of the Board of Public Works of Virginia.

[A.]

To the Board of Directors of the Roanoke Navigation Company.

In making to you their annual report of operations on the Roanoke, it is proper for them to observe, that at the commencement of the present year, the undersigned, superintendants of the Roanoke navigation company, had the most confident expectation of being able to reach Clarksville with the contemplated improvements of the river. This expectation, however, they regret to state, has been disappointed, and is chiefly attributable to the high state of the water during a part of the spring and summer, and nearly the whole of the fall, which rendered sluicing extremely difficult. During the time, however, they were able to work in the river, their progress has fully equalled their most sanguine expectations.

The improvements made on the river, during the present year, are as follows:

A neat coping has been put on the walls of the aqueduct over Chockaott creek, which has rendered that work complete, unless it should be deemed proper to put a railing on the towing-path side of the arch.

The canal at Eaton's falls, has been completed; some necessary alteration made in the lock at that place, and a sluice constructed between the lower outlet of the lock and the navigable water below it; this sluice being necessary to keep open a bed of gravel, as well as to supply a sufficient quantity of water in the lock. After finishing at Eaton's falls, the superintendants made immediate arrangements for commencing operations above. The falls rendered navigable, with the estimated expense of improving them, are in the following order, ascending the river:

Allen's and Hamlin's falls are sluiced, though the long sluice, nearly opposite Hamlin's house, after trying it at a time when the river was very low, is found to require additional work; the other sluices answer very well. The expense of these improvements, has been estimated, by the late engineer of Virginia, at	$3,750
Ballard's shoals.—The necessary works have been constructed at this place, and the navigation good; estimated expense,	1,000
Pugh's falls.—Here the superintendants came to the determination of building a lock in conformity with the advice of the engineer; and, accordingly, a lock of 5 1-2 feet lift has been erected, which, with the other works connected with it, affords excellent navigation through these falls. Estimated cost of these improvements,	3,500
Ledge at Cotton island.—This ledge has been cut through, and a good boat passage produced. The expense of this work is included in the estimate for improving Lizzard creek shoals.	
Lizzard creek falls.—The necessary works have been constructed at this place, in a very satisfactory manner, affording very excellent sluice navigation, with the advantage of a good towing wall. Estimated expense,	1,100
Stone-house creek shoals.—These shoals have been improved by wing walls, and, it is believed, will answer very well. Estimated expense,	800
Carried forward,	

Collar-bone falls.—At this point, the ledge has been cut through, wing walls erected, and the navigation free from all difficulties. Estimated expense,	$400
Louer's shoal.—Wing walls have been constructed at this place, which will probably be sufficient to insure good navigation at all times; but a rise in the river, before the walls were fully completed, made it necessary to send the laborers up the river; and as it has not been very low since, it is possible more work may be required. If any more should be wanted, it will be very trifling. Estimated expense,	100
Black falls.—When these falls were examined, the river was above ordinary summer height, and it was difficult to determine positively, whether any improvements were necessary, but the depth of water was such as to induce a very reasonable belief, that no work was necessary to ensure good navigation at all seasons. Nothing, therefore, has been done at this place.	
Horse-ford falls.—These falls have been improved by cutting down the ledges, and by side and wing walls, which afford very good navigation. Estimated expense,	600
The estimated expense of the improvements, above Eaton's falls,	11,250
The actual cost of the foregoing improvements, after making a very liberal allowance for the labor of the negroes belonging to the company, has not exceeded the sum of	10,500

The long sluice at Hamlin's embraces the greatest fall in these shoals: it is laid out near the southern margin of the river bank, and has several lateral and wing falls to turn and keep up the water. This work was laid out and executed at a time when the river was not so low as could have been desired, and as before observed, is found not to afford a sufficiency of water at the lowest season. The chief difficulty is at the lower outlet of the sluice, which can be remedied by swelling the water a little from the next shoal below. This will give a sufficiency of water, and will lessen the force of the current, which is altogether too strong for an ascending navigation, and makes it necessary to construct a wing-wall on the bank. The hands are now employed on this work, which they can effect without getting into the water. With the exception of this difficulty at Hamlin's, the navigation is good to the foot of Bug's island shoals, a distance of 39 miles from Rock-Landing.

Under the authority vested in us by the Board, we have purchased for the company, nine negro men, to wit: Billy, Jack, Dick, Elleck, Moses, Amos, Toby, Aaron and George, which have cost $3,658.

CAD. JONES, } *Superintendants*
A. JOYNER, } *R. N. Co.*

6*th November*, 1824.

[B.]

To the President and Directors of the Roanoke Navigation Company.

The undersigned, treasurer of the Roanoke navigation company, reports, that the sum remaining in the treasury at the last general meeting of stockholders, on the —— day of November, 1823, amounted to	$11,258 37
And that, since that period, there has been received from stockholders, the sum of	22,468 30
Amount received of John Hallowell, for negro Joe, sold by him,	350 00
Amount carried forward,	$34,076 67

Amount brought forward,		$34,076 67
Received of Mr. Proudfit, for tolls collected by him since last general meeting, on produce, &c. carried through the canal,		*596 37
Total amount to be accounted for,		$34,673 04
And that, during the same period, disbursements have been made on account of outstanding debts at the last general meeting, and for improvements on the canal and river since that time, amounting to	$18,238 14	
And for the purchase of 9 negroes, to wit: Billy, Jack, Dick, Elleck, Moses, Aaron, Toby, Amos, George,	3,658 00	
Advanced to Richard Apperson to purchase negroes,	1,000 00	
		22,896 14
Balance remaining in the treasury,		$11,776 90

A. JOYNER.

6*th November*, 1824.

*The total amount of tolls on produce, &c. carried through the canal from 1st November, 1823, to 1st November, 1824, is,	$745 10
Deduct Mr. Proudfit's commission for collecting tolls,	148 73
Balance as above stated,	$596 37

[C.]

Return of the state of the Roanoke Navigation Company, on the 6th day of November, 1824.

Capital stock,		$387,000 00
Aggregate of requisitions made on stockholders,		340,560 00
Amount paid by stockholders,		315,072 84
Amount due by stockholders,		25,487 16
Amount due by insolvent stockholders, forming a part of the amount due by stockholders,		8,032 00
Amount due by the Board of Public Works of Virginia,		00 00
Amount due by the Board of Internal Improvement of North Carolina,		00 00
Capital expended in the work to the 6th November, 1824,		310,872 92
Tolls received from 1st November, 1823, to 1st November, 1824,		745 10
Sums expended out of the tolls in repairs and improvements,		00 00
Expenses of collecting tolls,		148 73
Officers' salaries, viz;		
Superintendant,	$1,200 00	
Clerk,	300 00	
Treasurer,	400 00	
		1,900 00
Dividends declared and when,		00 00
Balance of money in hand,		11,776 90
Debts due by the company,		3,479 03
Debts due to the company otherwise than on account of stock,		372 75

CAD. JONES, *Pres't. R. N. C.*

REPORT

OF THE

DIRECTORS TO THE STOCKHOLDERS

IN THE

ROANOKE NAVIGATION COMPANY,

ON THE SUBJECT OF LOCKING INTO THE RIVER AT WELDON, &C.

LAWS OF NORTH CAROLINA, 1823—Chap. XVII.

An act concerning the Roanoke Navigation Company.

Be it enacted by the General Assembly of the State of North Carolina, and it is hereby enacted by the authority of the same, That the president and directors of the Board of Internal Improvements shall, if they deem it expedient, subscribe for and in behalf of the state, for two hundred and fifty shares in the capital stock of the Roanoke navigation company, in addition to the shares already subscribed for and owned by the state in the stock of that company; payment for which additional shares shall be made by the public treasurer, by order of the president and directors of the said Board of Internal Improvements, out of any money in the public treasury not otherwise appropriated, at such times, and in such amounts as said Board shall direct: *Provided,* That it shall be a condition of such subscription made by the Board of Internal Improvements with the directors of the Roanoke navigation company, that the said money shall be applicable only to the expense of locking down from the basin at Weldon's orchard into the river.

2. *And be it further enacted,* That this act shall be in force from and after the ratification thereof.

At a meeting of the stockholders of the Roanoke Navigation Company, held at Weldon on the 8th day of November, 1824, the following resolution was adopted:

Resolved, That the stockholders, not being fully represented at this general meeting, (there only being a bare majority present,) and it being very desirable that the opinion of the stockholders should be fully and fairly expressed upon the question whether the Roanoke navigation company will accept the subscription of $25,000 additional stock on the part of the state of North Carolina: this meeting postpones the decision of the question, whether they will lock the canal at Weldon into the river below, to be decided at a subsequent general meeting of the company; and do not, by publishing the report of the president and directors, give their assent or dissent to the opinion therein expressed.

REPORT OF THE DIRECTORS, &c.

Gentlemen,

At our meeting in May last, a proposition made by the Board of Internal Improvement of North Carolina, to subscribe $25,000 to the stock of the company, on condition that the same should be *exclusively* applied to a lockage at Weldon, was laid before us whereupon it was

"*Resolved,* That this Board have no authority to receive new subscriptions to the stock of the Roanoke navigation company, on terms varying from the charter."

The reasons which influenced the Board in coming to this resolution, are as follow:

The charter of the company provides, that new subscriptions are to be made "at such times and places, and on such terms and conditions," as the stockholders in general meeting may direct, (vide sec. 1.) This clause limits the general powers given to the directors in the 3d section, and makes the stockholders the sole judges of the expediency of receiving new subscriptions, as well as of the time, place and terms upon which they may be made. But, by acceding to the act of 23d Dec. 1817, the stockholders have consented "that the state of North Carolina shall, at any time, have the right to increase her subscription to the stock of the said company, so that her whole interest in the said stock shall not exceed the sum of $80,000:" they have, therefore, parted with the right to prescribe the time and the amount of the subscription on the part of the state, provided it does not exceed $80,000. But not so with regard to the terms: nothing is said in this act of the terms, and it is presumable the Legislature contemplated, that in making the subscription, the state was to come under such equitable regulations as might be established by the stockholders for the government of new subscriptions generally; and this presumption gains strength from the fact, that an express provision of the charter places all the stockholders, whether states or individuals, upon an equal footing, in proportion to the number of shares held by them respectively. The directors viewed the act of 1817, as barely securing to the state of North Carolina, a right to make her subscription equal to that of Virginia, and nothing more, except that there is no limitation as to the time it may be exercised; the right to annex terms remaining with the stockholders. They, (the directors,) therefore, if they could legally receive any subscription, certainly could have no authority for receiving one which proposed to subject the stockholders to conditions, and under this conviction, they thought it best to lay the matter over for the determination of this meeting.

Before approaching the main question, involved by this proposition on the part of the Board of Internal Improvement, it may not be improper to call your attention to a circumstance of minor importance connected with it.

In the last annual report of this Board, the idea is held out, that $25,000 is a sum sufficient to effect the proposed lockage, while nothing is said of the materials with which the locks are to be constructed, and this sum is offered to be subscribed on condition that it shall be exclusively applied to that object; there are 44 feet of fall from the basin to the river to be overcome, and it is believed, that less than $1,000 per foot of lift, will not be sufficient to effect the work with stone, while $10,000 is considered a sufficient sum to construct the whole chain of wood: the stone locks heretofore constructed on this canal, have cost upwards of $1,200 per foot lift, while in South Carolina, where the public works have been conducted by the state, similar locks have cost $1,500. If $44,000 are necessary to construct the locks of stone, and the state subscribes only $25,000, it becomes an important question with you to determine, whether you can conveniently supply the other $19,000 in case the state's engineer should determine to build of stone. If on the other hand, he should determine to build of wood, and an expense of only $10,000 is required, the difficulty of having the state recorded on your books as a subscriber for $25,000, while by your contract with her, you have parted with the right to demand of her more than $10,000, is involved. Before acceding to the proposals of the Board of Internal Improvement, it would seem to us proper that some understanding should be had on this point.

We are opposed to the project of locking into the river at Weldon, and we think it due to the occasion to state our views on the subject.

From the first settlement of the lower Roanoke to the present day, boats of from 30 to 50 tons burthen have been advantageously used from the foot of the falls to the mouth of the river: these boats are keeled and decked, draw from 4 1-2 to 6 1-2 feet water, and are navigated by four or five persons; the boats used on the upper river, (above the Great Falls,) are open batteaux of about 7 tons burthen, and navigated by never less than 3 men; these boats descend the river and canal from the mountainous districts to the basin at Weldon, which is situated about 300 feet from the river at the foot of the falls. It is proposed by the Board of Internal Improvement, to induce the company to open a communication between the basin and the river by locks, for the purpose of enabling the batteaux to descend into the river and continue their voyage to its mouth, 100 miles lower down, or leaving the river in the neighborhood of Williamston, to conduct them to Washington by a canal contemplated between those places. (Vide last annual report of Board of Internal Improvement.)

The notion (which is popular in some sections of the country,) of throwing the river open by these locks, and giving every place on its banks an equal opportunity for competing for its trade, is unreasonable; if the doing it merely depended on the pleasure of this meeting, no doubt it would be done. But the question is, shall we expend 25 or rather $44,000 to produce this equality among places? If we show that the interest of the company, and the convenience of the public is best consulted by not locking in, we apprehend that no consideration of advantage to any place, will induce you to adopt the proposition.

Let us see the effect of the plan proposed by the Board for Internal Improvements upon the price of transportation; the diminution of which, with the facilitating of the commercial intercourse of the country, is the great object of internal navigation.

In considering this branch of the subject, we shall throw out of view that part of the plan dependent on the Roanoke and Tar river canal, as it is probable that canal will not be shortly constructed, and confine ourselves to that which contemplates the continuance of the batteaux to Plymouth.

The present cost of transporting an hhd. of tobacco from Milton to Weldon, a distance of about 100 miles, is $5; there being no batteaux regularly engaged between Weldon and Plymouth, and consequently, no established freight, we will suppose that an hhd. might be carried from one of those places to the other for the same price, the distance being about the same, though it is well known here that the batteaux men greatly prefer the upper to the lower navigation; and for what carrying they have done on the lower, they have had at the rate of $7 per hhd.

Freight from Weldon to Plymouth, by batteaux carrying about seven tons burthen:

For a hogshead tobacco,	$5 00
For 1 bbl. flour,	62½

The boats used between Weldon and Plymouth, and between Weldon and Norfolk, are keel boats, have good decks, and carry from 30 to 50 tons of produce.

Freight from Weldon to Plymouth by these boats:

For 1 hhd. tobacco,	2 25
For 1 bbl flour,	25

Freight from Weldon to Norfolk by these boats:

For 1 hhd. tobacco,	5 00
For 1 bbl. flour.	50 cts. to 62½

Thus by using the large pole-boat instead of the batteaux, from Weldon to Plymouth, one-half of the whole cost of transportation between those places is saved; and, for the same sum for which the batteaux can place any commodity in Plymouth, the large boat can place it in Norfolk. Does not this furnish a sufficient reason, in itself, for not using the batteaux, and, by consequence, for not locking into the river? Can it be imagined, that any one would, of choice, forward a cargo of tobacco to Plymouth, in an open batteau, at five dollars per hogshead, when they can get it carried in a secure decked-boat, at two dollars and twenty-five cents, or give five for carrying it to Plymouth, when they can get it to Norfolk for the same money? If the locks could be erected in two years from this day, it is not believed that, at the end of that time, one boat in fifty would use them.

It is objected to the plan of having a transhipment at Weldon of the produce from the batteaux to the large boats, that it is attended with expenses which locking into the river would obviate.

The expense of drayage from the basin to the river:

For 1 hhd. of tobacco, is,	$00 16½
And for other articles, in proportion,	
The cost of building these locks of stone will be at least $44,000, on which sum, the company is authorised by the charter to receive 15 per cent. per annum in tolls, or $6,600. Suppose that 10,000 hhds. tobacco, or other articles yielding a toll equal to 10,000 should pass through these locks in one year, (which is more than double the quantity that ever has passed,) the company must lay a toll of	66
on each hogshead to get the 15 per cent.; but, suppose the company will be well satisfied to get one-half of what the law allows, then a toll of	33
must be laid; or even one-fourth, then a toll of	16½
must be laid. This statement is made with the view of shewing that the expense of lockage will probably be a fair set-off to the expense of portage.	

With regard to the other expenses of transhipment at Weldon, such as storage and commissions, if they could be saved by locking into the river, they would accrue at Plymouth, if the batteaux are used to that place; for, the produce raised on the upper Roanoke being generally of a description suited only to the European markets, must be carried to a port with which there is a European trade. Plymouth having but a limited trade of that kind, there must be a transhipment of the produce at Plymouth on board of the coasting vessels which visit that place; and it must be carried thence to some of the large markets of the United States before it can be sold, it not being pretended that Plymouth has capital to purchase it. Upon either of these plans, there must be an agency for transacting the business between the grower of the produce and the purchaser; and the question is, whether it had better be at Weldon, one hundred miles nearer the grower, and where it may be shipped direct to Norfolk, a town engaged in the European trade, for five dollars per hogshead, or at Plymouth, one hundred miles further from the grower, with the expense of five dollars per hogshead to get it there, and the additional expense of four dollars per hogshsad for getting it to New York, or some other town engaged in the European trade? The advantage is certainly on the side of Weldon, whether you regard the convenience of the planter, the cheapness of transportation, or the dispatch of business.

But, neither of these plans meet the full approbation of the directors. Their object is to rid the planters of all the expenses of transhipment, storage, and commissions, and to bring a market as near to them as the nature of the case will admit. Town-making is no part of the business of the company: but, if, in arranging the navigation, they should adopt a plan which, while it is best for this purpose, holds out the fairest prospect of producing a place of importance in a commercial point of view, such a circumstance should be no cause of objection to their plan. The process of pole-boat navigation, below Weldon, might, by new-modelling the boats, and increasing the number of them, answer the purpose of getting off the surplus produce of the country, while it is owned by the planters, who are generally satisfied to get their returns once a year; and with whom, whether they are received a few months earlier or later, is not a matter of much importance; but, it is too tedious and uncertain to answer the exigencies of commercial men: the life of commerce is a rapid exchange of commodities. If the produce is to pass into the hands of merchants before it leaves the Roanoke, and the supplies of goods for the country to take this direction, circumstances the most desirable, whether you consider the interest of the company, or that of the community dependent on this navigation, some more certain and expeditious mode than the one now in use must be adopted. With the view, then, of supplying the existing defects, and of producing the most beneficial results, the directors would recommend the introduction of steam-boat navigation on the river below Weldon. This is the highest point to which steam-boat navigation can be brought. It is situated at the foot of the Great Falls, which are barriers to any further ascent of the river. No one will deny that the interest of the planter requires his produce should pass into the hands of the merchant as near his home as possible. Weldon is preferred, therefore, to other places, as a point of deposit, solely because it is the nearest practicable one to the upland people; and, because, by adopting it, there will be no necessity for locking into the river. It is not supposable that batteaux will be employed for carrying produce, where steam-boats are engaged in the same business. It will be to no purpose, therefore, to effect a lockage, with a view of bringing them into the lower river, where they will not be used. And the only question is, does the situation of this river justify the attempt to use steam-boats? To satisfy you on this point, we have only to look to the experience of other sections of the country, and to see what effects have been produced from similar attempts, under like circumstances.

Col. Blanding, the superintendant of public works in S. C. in his very able report to the Legislature of that state, in speaking of the Congaree river, observes, that at "common winter water, boats drawing three feet can pass this river with facility," and that "three steam-boats have been run on it with considerable advantage." It is notorious, that the whole trade of Columbia, the second town in S. C. passes through this channel. In speaking of the Savannah river, he states that Hamburg was laid out on this river, June 27, 1821: there have been built 176 houses, and the population is 800 or 1000 souls. The steam-boats running between this place and Charleston are, "the Commerce, burthen 600 bales of cotton, draft of water 4 feet when loaded; the Hamburg, burthen 1000 bales of cotton, draft of water 4 1-2 feet; and the William Lowndes, burthen 700 bales, draft of water 3 1-2 to 4 feet;" he further states, "each boat can make a voyage to Charleston and back again, in about two weeks; and that the depth of water in the Savannah river, in ordinary seasons, is from *four* to *five* feet." In 1822, there were "27,857 bales of cotton, with considerable quantities of flour, tobacco, &c. received" at this place. He further states, in the same report, "that in the beginning of 1819, three or four houses formed the village of Cheraw, on the

Pee Dee: there are now 250 houses in it, and the population has increased from 35 persons to more than 800. From the 1st July, 1822, to 1st July, 1823, it shipped upwards of 15,000 bales of cotton; between this place and Charleston, three steam-boats, four team-boats and several pole-boats are engaged."

The common winter water in the Roanoke, cannot be stated at less than 6 feet, and it is believed to be 7 or 8; now, if 3 feet at "common winter water" on the Congaree is sufficient for the steam-boats engaged in the trade of Columbia, 6 feet on the Roanoke must be sufficient for our purposes; and, if from 4 1-2 to 5 feet at ordinary water on the Savannah is sufficient for steam-boats carrying from 600 to 1000 bales of cotton, there can be no objection to using steam-boats on the Roanoke, founded on a want of water. But, if any difficulty should still exist on this point, it will be removed by the following fact. Mr. Fulton, the civil engineer for North Carolina, of whose abilities there can be no question, made an examination of the river from Weldon to Plymouth, in 1822, and reported that 5 feet of water, at all seasons, might be produded for 21,769 dollars, a sum less than that proposed to be applied to the lockage by 3,231 dollars. Five feet being ample for any steam-boat you may wish to use on the Roanoke, it is clear you can bring such from Plymouth to Weldon, at all seasons of the year, for less money than you can carry the batteaux from the basin in the latter place, to the former. The capacity of the Roanoke for steam-boat navigation, then, is considered to be demonstrated, and it remains to be shewn, that the Dismal Swamp canal, by way of which we propose to reach Norfolk, is also capable of this kind of navigation, or rather that steam-boats may be passed through it; for, it is not proposed to use the steam while the boat is in the canal, but to take her through by the same means used for taking other boats through. The width of this canal is 33 feet at the narrowest places; the depth of water is 4 1-2 feet, and the new locks, the last of which we are advised will be erected during the next season, are 96 feet long and 18 wide in the clear; locks of this size, it is believed, will receive a boat carrying 120 hhds. of tobacco at least, under deck; the paddle wheels being placed in the stern instead of on the sides, a mode of construction common on the Mississippi, and found to answer every purpose. From these facts, it would seem the practicability of the plan cannot be doubted; on the necessity of it, or some other which will bring trade nearer to the planter, we will make a few remarks.

The Roanoke is one of the longest rivers east of the Alleghany mountains; it is susceptible of batteau navigation, according to the reports of the engineers who have been engaged on it, from Weldon 180 miles up the Staunton, and 193 up the Dan; and it is believed, the navigation may be carried considerably further on both branches. From Weldon to its mouth, the distance by the river is estimated at 100 miles, making a total navigable extent of something like 300 miles: Such an extent of batteau navigation is not known to be used any where in the United States. Nor can it be used with advantage: farmers will not leave home long enough to perform such a voyage, and if they would, the expenses would nearly consume the profits of the cargo. It is evidently then good policy to shorten this great extent of batteau navigation, by substituting a better at the highest point susceptible of it. The trade of the country bordering on the upper river and its branches, has hitherto gone to the towns situated on the waters of James river, or to Fayetteville; and although it has been carried on over land at a vast expense of time, labor and money, yet so inveterate is habit, that nothing short of the most glaring advantage, will be a sufficient inducement to divert it from its accustomed channels. The large planter who sells his own crop in town, and the merchant who sells that of the small planter or farmer, will not reckon the inducements which a batteau navigation of 2 or 300 miles in extent, terminating at an inconsiderable village, will hold out as sufficient, for the abandonment of his old trading friends in town, while the produce of one is transported by his own teams during winter, and the expense of hauling the other, is charged upon his customers. Nothing short of the most efficient navigation, and that resting upon a trading town equal to those they have been accustomed to deal at, will bring about a complete diversion of the trade: Norfolk is such a town, and the nearest approachable by the lower Roanoke boats, and we propose to go there, believing that in a few years, Weldon will be of sufficient importance to make the planter look to it alone as a market. The rapidity of the current of this river makes it necessary to use a stronger power to overcome it than mere manual labor, if you would produce dispatch in the ascending navigation; while its want of an outlet to the ocean, and the bays and estuaries with which by nature or art it is connected, adapts it peculiarly to steam-boat navigation. We calculate a steam-boat may run from Weldon to Plymouth in one day, thence to the neighborhood of the Dismal Swamp canal during the night, (steering through Albemarle sound and the lower part of Pasquotank river, by the compass,) thence to Norfolk certainly by the close of the third day after leaving Weldon; she will probably discharge her cargo at this place, believed to be the point from which a large portion of the Roanoke produce will be shipped abroad; but if any circumstances should make it desirable, she may in the course of the fourth or fifth day be at Richmond or Petersburg, on the sixth at Baltimore, or any town on the Chesapeake bay; or upon leaving Albemarle sound, she may pass into Pamptico, and in one or two days be at Washington or Newbern, if any part of the trade should seek that direction. The holder of produce will be on as good a footing at Weldon as he will be at Petersburg in all respects except the want of capital at the outset, and on a better footing in respect of getting his produce to the one place or to the other: to Weldon he has water carriage, to Petersburg land; the water carriage from the up country to Weldon, is greatly more than an off-set for any advantage Petersburg may have over Weldon, for shipping the produce after its arrival at either place.

Waggonage from any average point on Roanoke:

To Petersburg, per hhd.			$17 00
Transportation to City Point,			25
Freight to Weldon from an average point,			5 00
Ditto to Norfolk by pole-boats,	$5	average,	4 00
Ditto do. by steam-boats, probably,	3		

Difference in favor of Weldon, $8 25, and there can be no doubt it will be done for less, so soon as the business gets fully into operation, and competition is excited.

Weldon, under this system, may become a place of considerable trade. All that is wanting for this purpose, is enterprize, and capital; the first many of our citizens possess, the latter is in the hands of a few; they are however generally keen-sighted enough to find out the points at which it may be profitably employed, and we may reasonably suppose it will flow in sufficient abundance to Weldon, when the proper facilities for using it are opened. The same circumstances which have followed the use of steam-boat navigation on the Savannah and Pee Dee, will probably follow the use of it on the Roanoke; at least we see no reason why it should not: if so, in a very few years the market at Weldon, like those at Hamburg and Cheraw, will be equal to the demands of the country. In the mean time, this place is liable to no objection on the score of want of capital, which is not common to other places on the Roanoke; for, all the towns on this river are deficient in this respect.

There is one circumstance connected with the plan of making Weldon the place of deposit on the Roanoke which is worthy of observation, and that is the immense water power in the vicinity of this place afforded by the Roanoke canal. There is perhaps no place in the United States, approached by steam-boats, where there is a more extensive command of water, and where it could be more conveniently applied to machinery. Here we have 80 feet of fall, with a volume of water 30 feet wide and 3 deep, drawn from a never-failing source. What in all probability induced the location of Richmond at the falls of James river, and Petersburg at those of Appomattox, but the water power at those places; and what contributes mainly to their prosperity but the same cause? If so, Weldon has a decided advantage over every other place on Roanoke in this respect at least. If capital could be brought to Weldon for commercial purposes, there is every reason to believe, that in a very few years, there would be considerable investments of it in machinery, and the occurrence of no circumstance can be more important to the company and the community. The sale of water rights will be a source of profit to the company, and whatever sums of money may be received from it, will be so much to be deducted from the imposition of tolls. The reduction of the tolls thus operated, will be a clear saving of so much to those who use the navigation. The wheat raised below the falls is now shipped out of the state for a market; above them, little or none is raised for the want of a market which can be approached by water, it being an article which will not bear land carriage for any great distance. If a wheat market could be established at Weldon equal to the demands of the country, it would produce an important and desirable change in the agriculture of the Roanoke; the inferior tobacco lands, which yield next to no profit, would be cultivated in wheat and clover, and a system of amelioration would take place of the existing system of exhaustion. The

All the Staunton river, a considerable part of the Dan and Roanoke, are within the territorial limits of Virginia. This state and its citizens have contributed a large portion of the funds used and to be used in the improvement of their navigation. In making any arrangement of the navigation, calculated to effect the trade of the river, it is considered, therefore, but justice, so to dispose it as to insure a participation of the benefits of the trade by the two states, particularly when the arrangement can be made with advantage to the company and to the planter, which has been shewn. The effect of the plan proposed by the directors, will be to give to Weldon the profits of the transactions with the growers of the produce; they will there sell their crops and lay in their goods for domestic use; and to give to Norfolk that which is incidental to purchasing for and shipping to the foreign market, connected with which would probably be the supplying Weldon with foreign goods. If Plymouth is made the place of deposit for the Roanoke produce, and the planter could be induced to go there, Plymouth would receive the advantages designed for Weldon; and New-York, that has done nothing for our navigation, those designed for Norfolk. Shall we adopt a plan prejudicial to the interest of Norfolk and not advantageous to ourselves, for the sake of swelling the trade of New-York? The directors will throw their weight into the scale of Norfolk.

The introduction of batteau navigation between Weldon and Plymouth, the consequence of the proposed lockage, will be of no advantage to the important section of country lying between those places, it already having a better navigation; but, that the introduction of steam-boats on this section of the river must be productive of the most beneficial results no one it is believed will deny. Why is it that less fertile lands on James river will command 100 dollars per acre, while the more fertile lands on the Roanoke are valued only at about one third of that sum? Is it not attributable solely to the superior navigation of James river? If so, any plan which goes to lessen the disparity in this respect, must be a better plan than that which proposes no such result; and so far as regards the interest of the land-holders below Weldon, the plan of introducing steam-boat navigation is as much better than the plan for introducing batteau navigation, as steam-boat navigation is better than batteau navigation.

For information on the subject of the improvements made in the navigation of the river since the last annual meeting, and the other transactions of the company's agents, we beg to refer you to the report of the superintendents and that of the treasurer, and to our records and accounts; all of which are laid before you.

CADWALLADER JONES, *President.*

WELLSBURG AND WASHINGTON TURNPIKE COMPANY.

Return of the state of the Wellsburg and Washington Turnpike Company, on the 20th day of November, 1824.

Capital subscribed by individual stockholders,	$11,700 00	
Capital subscribed by Board of Public Works,	5,000 00	
		$16,700 00
Aggregate of requisitions made on stockholders, (whole stock)		16,700 00
Amount paid by stockholders, subscription by the Board of Public Works included,		12,782 05
Amount due by Board of Public Works,		00 00
Amount due by individual stockholders,		3,917 94
Capital expended in the work,		12,719 72
Officers' salaries:		
Superintendent,	300 00	
Treasurer $204, clerk $122 46,	326 46	
		626 46
Other expenses,		93 58½
Balance of stock in hand,		62 33

CORNELIUS H. GIST, *President.*

SNICKER'S GAP TURNPIKE COMPANY.

Return of the state of the Snicker's Gap Turnpike Company, on the 8th day of April, 1824.

Capital stock subscribed,		$84,375 00
Aggregate of requisitions made on individual stockholders,	$64,375 00	
Aggregate of requisitions made on the Board of Public Works,	5,000 00	
		69,375 00
Amount paid by individual stockholders,	63,254 46	
Amount paid by the Board of Public Works, through deposit in the Farmers' Bank at Winchester,	5,000 00	
		68,254 46
Amount due by the Board of Public Works,		15,000 00
Amount due by individual stockholders,		1,120 54
Capital expended in the work, exclusive of subscription from the Board of Public Works,		82,555 93
Tolls received from the 8th day of April, 1823, to the 8th day of April, 1824,		654 19
Sums expended out of the tolls, in improvements and repairs,		342 07
Officers' salaries, and expenses of collecting tolls, in detail:		
Treasurer's commission	89 88	
Gate-keepers' salaries,	137 50	
		227 38
All other expenses and for what:		
Expenses at the several meetings,	64 31	
Agent's expenses on commission to Alexandria,	15 54	
Carried forward,	$79 85	

Brought forward,	$79 85	
Postage of letters, &c.	1 84	
Printer's accounts,	9 87	
Clerks', sheriffs' and attornies' fees,	170 69	
Writing paper,	75	
		$263 00
Dividends declared, and when,		00 00
Balance of money in hand, exclusive of funds from Board of Public Works,		556 88
Debts due by the company,		15,781 10
Debts due to the company, other than from stockholders,		00 00

A true copy from the books of the Snicker's Gap turnpike company.

N. C. WILLIAMS, *Treasurer.*

RICHMOND, November 25th, 1824.

Annexed you will find the treasurer's report of the Snicker's Gap turnpike company. I have only to add, that the road will, in the course of the next year, be nearly completed, provided the funds will hold out. But one gate on the road has made any collections the present year, and that only a short time, in consequence of the repairs being near that gate, which is erected on the top of the Blue Ridge. The gates at Beaver dam and Goose creek have been left open, in consequence of being compelled to build a bridge over one of those streams, and graduate the hills at those places. Our contracts the present year, (which are not yet completed,) will amount to upwards of thirteen thousand dollars, and are to be paid out of the funds furnished by the Board of Public Works. When the road is in that condition to set the gates upon the sections, it is confidently believed the profits will be considerable; but, until it is completed, the tolls will be small, as there are several changes to make in the bed of the road the next year.

Yours, *&c.*

D. CASTLEMAN, Jr.

President of the Snicker's Gap Turnpike Company.

The President and Directors of the Board of
Public Works, Richmond, Virginia.

SWIFT RUN GAP TURNPIKE COMPANY.

Return of the state of the Swift Run Gap Turnpike Company, December 4th, 1824.

Capital subscribed:		
By individuals,	$69,700 00	
Commonwealth of Virginia,	4,100 00	
Board of Public Works,	46,000 00	
		$119,800 00
Aggregate of requisitions made on stockholders,		69,700 00
Amount paid by stockholders,		68,689 00
Amount due by the Board of Public Works,		
Amount due by individual stockholders,		1,011 00
Capital expended in the work,		126,012 23
Tolls received from 1st December, 1823, to 1st December, 1824,		4,150 02
Sums expended out of the tolls, in improvements and repairs,		7,223 23
Officers' salaries, viz:		
Secretary and treasurer, per annum,	133 34	
One gate-keeper,	200 00	
One ditto,	150 00	
One overseer,	325 00	
Carried forward,		808 34

Brought forward,		
All other expenses,		
Dividends declared since last return,		
Balance of money on hand,		$397 94
Debts due by the company, viz:		
To sundry persons for the surplus of their stock which was sold for the instalments due thereon,	$186 23	
To sundry persons for negro hire the present year,	398 50	584 73
Debts due to the company other than from stockholders,		

WM. ALLEN, *Secretary.*

SUPPLEMENTAL REPORT

OF THE

BOARD OF PUBLIC WORKS

TO THE

LEGISLATURE OF VIRGINIA.

10th February, 1825.

Sir,

I have the honor herewith to communicate, at the request of the Board of Public Works, the Supplemental Report to the General Assembly, adopted by them on the 8th instant.

Very respectfully, Sir,
Your most obedient,
JAMES PLEASANTS, *President.*

The Honorable the Speaker of the House of Delegates.

SUPPLEMENTAL REPORT.

The Board of Public Works, referring to their Annual Report communicated to the General Assembly on the 22d December last, beg leave to submit the following Supplemental Report.

In the view therein exhibited of the condition of the fund for Internal Improvement, and estimate given of the receipts and expenditures within the year, it was made to appear that there would be a small surplus, after meeting all the engagements entered into by the Board. The estimate of expenditures was confined to the payment of subscriptions to corporations and sums chargeable upon the fund by acts of the General Assembly, and did not embrace charges for surveys, salaries and other contingent expenses. It was suggested, however, that the deficiency, or sum required to defray all the contingent expenses, might be raised by borrowing the amount on a pledge of some part of the acquired stocks of the fund, and though there is no reason to doubt that this can now be done, the Board on farther reflection deem it best to limit their expenditures by the actual receipts within the year, notwithstanding a disability to comply with some one or more of their engagements may thereby be created. This course will not prevent a compliance on the part of the Board with all the positive existing engagements, and after fulfilling all of them there will remain a sum sufficient to defray the contingent expenses of the year. The Dismal Swamp Canal Company, to which there is conditionally due an instalment of $15,000, part of a loan made to that company by virtue of authority derived from the General Assembly, must, however, from the condition of the fund, and the prior claims of other companies, be postponed to another year. It is not considered, however, that much inconvenience will result to that company from the inability of the Board to pay this instalment at this time, as from information communicated to the Board, it would appear that the whole amount receivable from the loan would be insufficient to complete that important work, rendered the more so by the commencement and prosecution of the Chesapeake and Delaware Canal, with which it forms two links of the chain of inland navigation for the whole extent of our eastern sea coast. It is not necessary here to express an opinion of the utility and value of this canal, both in a commercial and political point of view; the views and opinions of this Board in relation to it, having been so frequently communicated to the General Assembly, whose acts for several years past, giving support and encouragement to the work, establish and confirm its great importance. It may, however, with propriety be remarked, that the connexion with the Roanoke formed within a few years past, and with a view to accomplish and perfect which, the canal has been greatly enlarged, has conferred much additional value, and extended the sphere of its utility. In addition to the weighty considerations which suggested and prompted this improvement, and have encouraged its prosecution to a state but little short of completion, the great amount of capital expended, of which the Commonwealth has paid two-fifths, requires that an effort be made to render available the money invested, and save the interest of the public, and those citizens more immediately concerned. The Commonwealth, moreover, is a creditor to a large amount, and has security on the works; it is therefore of more importance to her that the work should be completed, than to the individual stockholders. Upon the representation, then, of the company, that their funds are inadequate to the completion of their canal, and that the stockholders may be induced to subscribe additional shares, with a view to raise money with which to prosecute their labours and discharge their pecuniary engagements, it is respectfully recommended to the General Assembly to pass a law authorising the Dismal Swamp Canal Company to increase their capital stock. The result, if the privilege shall be granted, and the stockholders shall be successful in their efforts to create new stock, cannot but be beneficial to the Commonwealth, inasmuch as the value of her stock will be advanced, and her interest as a creditor be better secured. The report of this company communicated to the General Assembly, with the annual report of the Board, is referred to for information as to the present state of the canal, by which will be seen what work remains to be executed, as well as how unimportant, not to say useless, the expensive and costly improvements effected within a few years past will be, unless that work can be completed.

JAMES PLEASANTS, *President.*

8*th February*, 1825.

REPORTS

OF THE

PRINCIPAL ENGINEER

TO THE

BOARD OF PUBLIC WORKS.

FIRST REPORT,

On the Location of the Canal through the Blue Ridge.

RICHMOND, June 24th, 1824.

To the President and Directors ex-officio of the Board of Public Works.

In the latter end of April last I located and staked out the canal through the Blue Ridge. My report on that operation was intended to make part of my general winter report, but a circumstance which I deem of much importance induces me to address you now on this subject.

During the location I was accompanied by the commissioner of the Kanawha Road and Navigation, to whom I explained very minutely my views. Besides this, I wrote to him specifications of the most material points of the intended work. Since my return from Clarksburg I received from him a letter which informs me of a change in the location of the dam; and I have learned from a private source, and by the perusal of the contracts, that the contemplated works depart in some essential points from what I had recommended.

I am far from supposing that my plans could not receive some useful modifications; I am perfectly ready to subscribe to any opinion that may be professionally proved best calculated to promote the public interest; but on the other hand as in the plans I recommended, I had the interest of the James River trade constantly in view; as I did not come to my conclusions without mature deliberation, and none of the changes made had escaped my investigation, I cannot so far forget the duty prescribed to me by law, as to sanction by my silence, plans I had rejected, and especially when they appear before me unsupported by professional arguments, and in the naked shape of mere matters of opinion.

Under such circumstances, I think it incumbent upon me to offer as early as possible my objections against changes of which I have not been even apprised officially, and to at least develope the reasons, which after due consideration, determined in my mind the adoption of my own plans, and rejection of those that have been substituted in their stead.

In the following statement I will confine myself to the facts of which I have positive evidence, and which I think of material importance, although I consider that every particular of such an expensive work is of much moment, and that it is only by a skilful management of every detail, that a reasonable economy, combined with strength and permanency, can be obtained.

But these details, not affecting the contracts which have been very wisely made by the yard, perch, or other units of measurement, and depending wholly on the skill and experience of the private engineer attached to the work, they do not require an immediate attention on my part.

THE DAM.

The first change, and the only one of which I was apprised officially, is the removal of the dam from the site I had chosen to one about 3-4 of a mile higher up. The only motive alleged for this change is, as the commissioner informs me, that many respectable and intelligent gentlemen decided that my location did not comply with the law. This imputation of my having disregarded the law, I will answer to before explaining the various advantages of each site.

The object of the law appeared to me to be the opening of a safe navigation through the Blue Ridge, from the North Branch to the Irish Falls. By means of the dam I proposed, the water was to be backed up to the mouth of the North Branch, and the entrance of the canal half a mile below, was at least as safe as in the new plan: This was I conceived in perfect consonance with the law, and especially as I thought there was some economy in my plan, and the law certainly implicitly recommends it. I took the spirit of the law. The gentlemen above mentioned, adhered to its letter.

But it should also appear from the wording of the law that the canal should be made on the Amherst side; and yet considering the extreme difficulty of it, I again consulted the intention of the law, and crossed the river, as proposed by my predecessor, above the Cushaw Falls. Here the gentlemen already referred to, took, like me, the spirit of the law; and by their approbation implicitly invalidate the motive adduced for the change of the dam.

The plan of Messrs. Moore and Briggs was to supply the canal with water through the first section, from the North Branch to the Cushaw Falls by raising a dam 8 feet high across the mouth of the North Branch.—From this plan I departed for the following reasons:

It appeared to me that for the present, and until the canal shall be further extended, boats coming down the James River would have to lock up through the dam into the North Branch, and then to lock down again to come to the level I begin from. This plan, besides the present additional expense of two locks, would be liable to another objection. That in a low stage of the water boats could not approach the foot of the dam at that place; and even, if the canal was carried up the James River I doubt whether this plan would be advisable: For, the North Branch empties itself at about right angles into the James River. Close to its mouth, the eastern shore is formed by a high and steep spur of the Blue Ridge; the western shore is alluvial; and consequently on this side, the abutment would be difficult to make strong: on the other hand, the eastern abutment would be so close to the foot of the hill that there could be but little room left for the entrance of the canal, which must either be dangerous or expensive: For, then an artificial entrance must be made up the North Branch by walling in a very deep place.

Having satisfied myself that a dam across the North Branch was not advisable, I examined the various sites in the James River, and hesitated some time between the site proposed by me and that chosen since by the commissioner.

The latter is a ledge of rock immediately at the confluence of the two rivers, and nearly in the prolongation of the eastern shore of the North Branch.

The site I recommended is a ledge of rock about 3-4 of a mile below, at the Flat Rock Falls.

In the event of the canal being immediately carried up the river, I would give the preference to the first site. My principal objection to it, under present circumstances, was that, in general, and particularly when the North Branch is higher than the James River, it might be dangerous for boats coming down James River to double the point of land at the junction of the two rivers, and stem the current of the North Branch so close and parallel to the dam; and it appears to me that while the law contemplates a safe navigation, a plan attended with danger cannot be agreeable to it.

This danger would not exist any longer if the boats came down a canal and crossed the North Branch instead of coming down the river; in such a case, I repeat it, I would prefer this location.

In addition to the preceding objection, I considered that for the present, there would be some additional expense attending this site; viz: 1st, the dam must be both longer and higher than the one below: 2nd, half a mile more must be excavated; (This distance by my plan is to be navigated in the still water produced by the dam:) 3rd, the lockage would be increased by about 6 feet: 4th, the fall of the river being little between this and the lower site, paving or walling would be required for a greater length, before the canal would be out of the reach of freshets.

All these last objections would of course also be done away, if the canal was now continued up along the whole margin of the river.

At the site I had selected, a strong wall was necessary to protect the guard lock and beginning of the canal against the power of the current. This was the only objection I found against it.

The level adopted by the commissioner will also prove more expensive on approaching the Big Balcony Rock, since the canal will have to be upheld artificially at a greater height and its whole width must, in that case, be blasted out of the high and vertical cliff at the Balcony Fall.

I grant, however, that near a place so dangerous as the Balcony, a greater expense might be justified by the advantage of placing the canal out of the possibility of injuries by freshets; for, economy must cease to be a motive, where there exists doubts as to the permanency of the work. But from what I could judge from the drift and the inquiries I made, which were frequent and minute, I thought that my line was fully high enough at that place; and here again united security and economy.

THE LOCKS.

The plan of the locks totally differs from that recommended by me. They are intended to be made in imitation of the locks near Richmond. This is the most serious object of consideration I have to lay before your honourable Board. I will not dwell on some differences of detail which cannot have any influence on the interest of the navigation in the canal; but I deem it of importance to state at full length the motives which induced me to propose for the locks a width different from that used below; since the activity of the trade must greatly depend on the dimensions of the locks.

In the first place, it is advantageous that boats should be drawn by horses: if a very heavy boat is drawn by a horse, it cannot travel far; time is lost. On the contrary, if the boat is too light, very little produce is transported; and although the horse moves faster, the trade also loses in this case, besides the injury the canal receives from a great velocity of the boat.—There is, consequently, a load which produces the most advantageous use of a horse; this is thought to be from 25 to 30 tons; hence boats 70 feet long and between 8 and 9 feet wide, drawing from 2 to 2 1-2 feet of water, will answer the purpose of a good canal navigation. These proportions are also such as experience proves to be most advantageous, the length of the boats being from 6 to 8 times their width.

2dly. The width of boats must not be more than one-third of the width at the surface of the canal, or about one half of the bottom; or else, they could not pass each other in the canal. Hence, in a canal 40 feet wide, boats from 13 to 14 feet wide, might be used; but in a canal 30 feet wide, they cannot be more than 9 or 9 1-2 feet in breadth.

3dly. There is no advantage in passing two boats at a time through a lock; and indeed experience proves that about five boats will pass through a single lock, while four pass through a double one; this fact may be supported by the following observations:

A double lock holds, from the breast wall and for the length of a boat, exactly double the quantity of water of a single one; hence, double the time is required to empty or fill that part of it.

Besides this, there is, between the end of the boat or boats and the angle of the gates, a space necessarily left to enable the gates in turning to clear the boat; this space in a double lock is even more than double in length that in a small lock, although the gates are only double; this is owing to the position of the boats in each case; hence, because that space is more than double in length, and is also double in breadth the corresponding space in a small lock, it follows, that it holds at least four times as much water in a double lock, and requires a proportional increase of time to be filled or emptied.

The same thing may be remarked of the triangles formed by the gates, which triangles being in a duplicate ratio of the gates, hold in a double lock four times as much water as in a single one, and therefore require also a fourfold time to empty or fill that part of a large lock.

Again, it requires more than double time to open the gates of a double lock. Their weight, the length of the beam, the necessity of crossing the lock to open both, makes this evident.

Some time is also lost by the two boats arranging themselves in the lock.

From all the last circumstances, there can be no doubt that more time is lost in a double than in a single lock.

Another very strong objection to double locks is, that very frequently a single boat presents itself, which spends as much time and wastes as much water as two boats.

4thly. From all the foregoing remarks, it will appear obvious that a small lock is also *cheaper* than a double one.

1st, its floor is narrower; 2d, the digging and expense of foundation is less; 3d, its chamber may be made shorter, since the gates require less space to clear the boats: This difference between a lock of 8 feet and one of 16 feet, might be as much as 5 feet; 4th, the outlet walls may be made much shorter, since they bear less pressure. In the preceding case there might be a difference of at least 6 feet.

5thly. The inlet walls are in a small lock shorter by the difference between its gates and those of a large one. In the above example this would be about 4 1-2 feet.

6thly. The gates themselves are much lighter and consequently cheaper.

7thly. The breast wall is only one-half in the small lock of what it is in the double one.

8thly. The buttresses opposite the gates need not be so strong in the former as in the latter, since the lateral pressure of the gates diminishes with their size.

Having premised the preceding obvious principles, which all unite in favor of small locks, I now proceed to apply them to the locks on the James River Canal. Near Richmond the canal is 40 feet wide; there is consequently a possibility of using boats 13 or 14 feet wide.

The coal boats might perhaps receive that dimension. For the accommodation of such boats the locks must be from 14 to 15 feet wide; but such locks could not conveniently admit at a time two boats measuring from 7 to 8 feet across; and therefore it was expedient, by an increase of one or two feet, to give admittance to two boats together.

But on the upper sections of the river, boats exceeding 9 1-2 feet in width could not be used, since as I have remarked, the canal is only 30 feet wide.

It may be said that it is precisely because the boats are not expected to be even quite 8 feet wide that the locks are made 16 feet wide to accommodate two of them at the same time; but I flatter myself that I have clearly demonstrated in my 3rd proposition the fallacy of this idea, and that locks of 8 feet in width would have over those of 16 feet the advantage of an economy of time, money and water. I thought at first of recommending them of that dimension, but upon considering that the most advantageous size of boats, as results from my 1st proposition, exceeds rather 8 feet in width, I thought that it was proper to give to the future trade on the canal the most favourable chance of activity: and, therefore I concluded to make the locks 10 feet wide, and I accordingly recommended this dimension to the commissioner.

Supposing now that the locks are made, as intended by the contract, of a width of 16 feet in order that two boats may pass at a time, these boats cannot measure more than 7 1-2 feet in breadth, and will not carry more than 20 tons? is not this imposing at once upon the trade the restriction of boating produce in disadvantageous bulks, and of passing slower through more expensive locks?

Perhaps by giving to the canal the depth of 4 feet, which I had recommended, instead of 3 feet which seems to be the contemplated depth, boats drawing 2 1-2 feet of water might be used; these boats might carry 26 tons and be pronounced sufficient: but this depth is not intended, and if it was, I would still insist on the propriety of even making the locks 8 feet wide rather than 16.

But by making the locks 10 feet wide, I allow of the passage of as wide boats as the canal itself will admit of; over that dimension there would be a waste of water, and, what is perhaps more important, of time. It may indeed be said, that boats measuring more than 7 1-2 feet could not pass two at a time in the locks near Richmond? but is the whole trade on a distance of 240 miles to suffer because of a trifling inconvenience at a few locks?

This is certainly a subject of serious consideration on a line of navigation of such length and importance. I came to my decision of adopting a width of 10 feet after a very deliberate investigation of the subject, and consequently cannot accede to a change, unless supported by stronger arguments than those I have adduced.

The plan of the locks is totally different from my own specifications; and although in every detail I recommended what I thought best, I will not fatigue your attention with minute circumstances which can have but little influence on the contracts, or on the trade; I will therefore confine myself to the two following facts:

The double locks, according to contract, are to be 75 feet long from the angle of the gates to the breast wall, and consequently will hardly hold boats measuring 70 feet in length.

The single locks I proposed are also 75 feet long between the same points, and will hold boats from 73 to 73 1-2 feet long. I had combined this length of the boats, together with their width and the depth of the canal, for the purpose of extending the contents of the locks, to boats carrying even 45 tons, drawing 3 feet of water, if it should ever be wished to use them. More than that could not be obtained by any other sized lock.

The other point of difference I have to notice, is the thickness and shape of the lock walls. In my report of the 12th of February last, I explained the advantages of giving a broad base to the walls of locks; the walls according to contract are to be made vertical on both sides: this requires that an excess of masonry should be added opposite the culverts, which would be unnecessary if the walls were broader at the base.

The walls are to be 6 feet thick in every case; this dimension in locks of 7 feet lift, will exceed by one foot, that is to say, 1-6 of the whole masonry, the thickness which I should consider amply sufficient for such locks; on the contrary, in the guard-lock near the upper gates, this dimension of 6 feet is not sufficient.

DEPTH.

The last deviation I will notice is the depth of the canal, which is reduced to 3 feet instead of 4 I had recommended; it is in general advantageous to increase the depth rather than the width of a canal; for, besides the advantages relative to filtrations and evaporation, it is evident that a broad boat carrying the same burden as a deep one will take more time to pass through a lock.—If this proposition was doubtful, I could quote almost all the canals of England, which are generally made deep.

I had therefore recommended to give to the canal through the Blue Ridge, a depth of 4 feet of water. I thought that this depth would hardly occasion an increase of expense in a section where so much of the canal has to be made on an artificial foundation; and besides, in general, the increase of expense produced by digging 6 inches more, and even 1 foot, bears no proportion to the great advantage of a draft of water of one foot more: I had, besides, another inducement to make the depth greater in that section; that the canal being mostly on made earth, filtrations would probably be greater, which I thought of compensating by an increase of depth and also by making the locks diminish gradually from the highest to the lowest.

Perhaps the depth of 3 feet was adopted contrary to my opinion, under an impression that the law required that depth; but the general law on the subject in date of the 17th of February, 1820, directs that the canal shall have "*at all seasons of the year, not less than three feet depth in every part thereof*," which I take rather to imply the expediency of its having *more*. There again my specifications were within the provisions of the law.

It must appear evident that I may be considered as having had but little agency, and consequently must be relieved from all responsibility in an operation, in regard to which, the law of the 8th of March last, positively expresses that "*the civil engineer shall locate the canal in such a manner as he may think best.*"

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Yet, whatever latitude was given to me by this law, I conformed to the terms of the law of the 17th of February, 1820. In turning over to it, it will be found that it refers to my predecessor's report, and that his conclusions agree generally with mine; except perhaps in this respect, that for the better transportation of the produce I prefer depth to width, an opinion whose truth, I think, I have sufficiently demonstrated, and which I might illustrate by an account of the dimensions of the principal canals of England, whose locks are calculated for boats measuring not more than 1-3 in width that of the canal itself and whose depth commonly bears to their width a greater proportion than 3 1-2 and even 4 to 30. (*)

I am gentlemen,
Your most obedient servant,
C. CROZET, *Pr. Engineer.*

	Width.		Depth.	Width of Locks.
	Top.	Bottom.		
* Canal of the Forth and Clyde,	56	27	8	20
Great Trunk, { near the Trent, - -	40	18	5½	14
near Hare-Castle, -	30	16	4½	7
Canal of Coventry, - -	78	16	4½	7
Canal of Thames and Severn, -	40	30	5	13
Canal of Monkland, - -	30		4½	
Canal of Worcester, - - -	42		6	15
Canal of Ashton, - - -	33	15	5	
Canal of Stafford, - - -	30		5	

On the Examination of the lower James River Canal.

RICHMOND, 23d December, 1824.

In obedience to the 5th section of the act of Assembly of the 8th of March last, I took every opportunity to inspect the works of the James River Canal on the two sections in progress.

The last time I saw the canal between Maiden's Adventure and Richmond, the work had been mostly stopped for this year. The dam at Maiden's Adventure Falls was very little advanced; only a small part of it about the middle of the river was completed. The abutments, the lock in the dam, and the connecting wall between the dam and the guard-lock, were finished. They all appeared substantially built.

The guard-lock was raised to a height of about seven feet, and more stone was preparing for it. The work seems to be built with care.

The digging is done along the whole line, with the exception of a few mounds left to answer temporary purposes.

The abutments in Wm. H. Pleasants's farm are partially raised.

At Beaverdam Creek, there is only some stone prepared for the guard-gates. The stone is of two kinds; one a hard coarse granite, procured from some distance below; the other whiter and not so hard, is intended for the hollow quoins, and obtained from Fine Creek on the south side. Both kinds appear very good.

Beaverdam Creek presents one of the greatest difficulties of the whole line. Owing to its proximity to the dam, and to the little fall of the river in its lower section, sufficient height cannot be obtained to pass the creek under the canal; it must unavoidably be received into its bed, where it will bring a great quantity of sand; to guard against which, as also against the torrent of water brought suddenly by the creek after a heavy rain, it has been deemed necessary to use a double pair of guard-gates, so contrived as to shut themselves, and thereby exclude a sudden rise of the creek from the canal, and force its too abundant waters over a broad waste constructed between the two gates. The contrivance by which this will be effected, is as simple as ingenious. The accumulation of sand between the two gates will be greatly diminished, and probably sometimes entirely prevented by the intended location of the waste, which is a considerable distance off the lower bank of the canal, whereby a recess will exist before the waste; and it is supposed, that in general, the slope of sand formed against it will not reach the main bed of the canal. It will, however, be prudent to have flood-gates in the waste, which, being lifted up in times of swells of the creek, will leave a free passage for the sand. They may also become useful after the creek has subsided, especially if there should be a high freshet in the river, as well as a rise in the creek: in which event the sand would probably not be forced over the waste, but might be raked out through it.

When the canal shall be extended up, it will be advisable to pass over this troublesome creek before lowering the new line into the old one.

The abutments of two bridges in the two next farms are finished.

Round Governor Pleasants's, the wall was finished and the bank behind it was very near its height: the wall appears well built; and it is proper to observe here, that the new proportions adopted for dry walls are generally safe. I should, however, have preferred to pave the bank there, insomuch as it has to be done for some considerable distance below; not that the saving would be great at that place, but rather for the sake of uniformity and strength: because this part of the canal being only 13 or 14 feet high, is liable to be overflowed in more than ordinary freshets; in which case I should depend more on a paved bank for resistance, than on a wall which is more exposed to be overthrown if any motion manifests itself in the backing, after it has been immersed for some time; and also the puddling, which rests against a wall, is somewhat liable to be gradually carried off through the interstices of it.

At the lower cliff, and for some distance below, the bank is wider than usual; which indicates that the location is nearer to the declivity of the hill than would be strictly necessary for the dimensions of the canal: this is accounted for by the expediency of keeping the bank away from the river. In several other places the bank is wider than 10 feet, but in general the reasons which occasioned extra digging are apparent: In Randolph's farm, the width of the bank is owing to the removal of the earth which has slipped from the hill.

The waste near Gov. Pleasants's is completed. A wooden waste in Doctor Trent's farm was just begun. The culvert in the same is done. Next come two farm bridges, whose abutments are only commenced. A wooden waste just above Genito Creek is completed, as also the double iron culvert under which the creek is discharged.

The public road at that place has been turned with much propriety. The expense of a bridge over the canal will be saved, and the road itself will be much better. It was not quite completed when I viewed it. The abutments of one farm bridge in this section were up; those of the next were only partially so.

The Dover aqueduct is done except the parapet walls; the work appears substantial, although the voussoirs of the arch were not fitted with perfect accuracy.

The bridge in Doctor Watkins's farm is completed, as well as the high wall and bank below, and also the waste. The oblique culvert over Rocky Run was finished and the centres removed: it is made of stones roughly fitted and grouted. Severe economy has recommended this plan in imitation of what seems usual in the New York canal: the slow hand of time will test it. I would prefer stones better jointed, or bricks. The bank was in a great state of forwardness.

From this point the level of the canal begins to be somewhat too high, and is soon let down by a lock of 4 feet lift. A short distance before this, there is a wall of 30 feet in height; it is well built: Although it may prove strictly sufficient, I should have preferred it a little heavier.

The 4 feet lift lock was nearly finished; the work is very good; the coping stones have been cramped together; it is an important precaution, which ought to be imitated in all the locks. To come down there by a lock was indispensable; but perhaps there might have been some advantage to have divided equally the fall from thence to Tuckahoe Creek, and made it about 6 1-2 feet instead of 4. There is a general objection to small lifts before high ones; which is, that they introduce less water into the intermediate basin than is drawn out below; this produces a constantly increasing deficiency, which becomes troublesome in a brisk trade. As far as I could judge from merely viewing the ground, it does not appear that any serious inconvenience would have resulted from a greater lift at this place: it would have produced some deeper excavation at first, in easy ground; but this would have been, at least partially, compensated by a diminution of the high embankment near the Tuckahoe aqueduct, and perhaps by a reduction of the elevation of the aqueduct itself. At any rate, if the present height of the aqueduct had been deemed indispensable, the clay over its extrados might have been dispensed with, and grout, covered with a thin paving of stones or bricks, substituted.

The wooden waste below the lock is done. The foundations for a bridge opposite the coal mines were preparing; that leading to Manakin ferry is in use, as also another bridge above Harris's waste.

The fears I expressed in my report of February last, in regard to the wall at this waste, have proved founded, and it became necessary to support it on the outside.

The bridge in Randolph's farm is finished. In this quarter, the ground is very bad and subject to slips: the only remedy against which, is a persevering attendance to the removing of the fallen soil, or else the building of a wall whose weight may supply the former resistance of the excavated earth.

The wooden waste just above Tuckahoe Creek is done.

The Tuckahoe aqueduct is completed with the exception of the parapet walls. It is a work of superior execution and which would do credit to any engineer. Much praise is also due to the contractors (Lawrence and Ledgerwood.) The architecture of this structure is plain, and such as belongs to this kind of works: It derives its beauty only from the naked outward perfection of its execution, which conveys to the mind a favorable opinion of the permanency of the edifice.

Next to the aqueduct, come three lift-locks, by which the line is lowered into the bed of Tuckahoe Creek; there wanted only some coping stones to finish them. These locks are built of good materials, and have all the appearance of careful execution. It might perhaps have been an advantage to have rounded off the four angles of the wing walls of each lock; it would have secured the corner stones against the danger of having some fragments broken off, by which the work might be disfigured. The culverts of these locks are somewhat different from those heretofore used: the water is made to fall into a vertical well, and is then conveyed horizontally into the lock-chamber, the culvert being consequently composed of two parts at right angles to each other; its transversal section is a square. This construction is more economical, but the water will not be discharged so fast.

The guard-lock at this place is completed. It is the second of the line. Its workmanship is good, as well as the stone. I remarked, however, that the water percolates through some joints of the facing near the lower gates: This must be ascribed to economy of hydraulic cement. It is to be regretted, that the high price of this important article has caused it to be used with a sparing hand in works of otherwise superior workmanship, whose durability is so important, and so much depends on the quality of the mortar.

On this interesting subject, I beg to introduce here a few observations. It is well known, that a mixture of lime and good sand, makes the cheapest mortar: In structures which are not exposed to water, it acquires a tenacity equal to that of any other cement. But when exposed to moisture, a grout of rich lime and sand, will not acquire hardness, and consequently, in damp soils will leave the backing or filling of masonry, open to percolation, and will hardly unite it to the facing.

In this case, the stability of the work depends more on the arrangement of the stones, than on the cohesion of the mortar; and the tightness of the joints of the facing may even sometimes become rather an injury than an advantage, on account of its favoring the hydrostatic pressure of the water which may find its way behind it.

Real Roman cement is indispensable only in foundations which are under water; in other cases a very good substitute may be made by mixing pulverised brick, instead of sand, with the lime. This mixture will harden promptly under water, and be very durable when not exposed to a current. Its tenacity will then become even greater than that of any other cement. There will enter in a bushel of this mortar, 0.60 of a bushel of brick powder, and 0.40 of quick lime reduced to a powder if by grinding, or 0.60 if by immersion. This last process consists in dipping the lime in water for a few seconds, after having previously reduced it to small pieces, and then packing it away into barrels or boxes, where it will continue to fall to dust, and will then acquire the remarkable property of absorbing its complement of water but slowly; a circumstance highly favorable to the tightness of the work to be built with it, since the mortar will then rather swell than shrink.

Mortar composed in this way will probably be much cheaper than that made of the N. York lime, of which I suppose that it may take 0.60 mixed with 0.70 of sand, (or better still, as it is not eminently hydraulic, 0.60 mixed with 0.30 of brick dust, and 0.40 of sand,) to make a bushel of mortar. The brick should be burned to its usual degree. On a due attention to the mixing and working of cements depends the preservation of hydraulic works: to such the common experience of masons is not adequate, and they must here implicitly and faithfully be guided by the superior knowledge and direction of engineers.

Below the three last mentioned lift locks, the old bed of Tuckahoe Creek is used. The work on this section is all completed. It presented no other difficulty than in securing the foundations of the works of art.

The water found its way under the guard gate which closes the middle mouth; it is undergoing repairs to render its foundation more secure. The flood-gates at the lower mouth are in danger of being blown up. This accident would not occasion any inconvenience to the canal, their object being entirely unconnected with the trade.

A short distance below the western mouth is the third guard-lock of the line. It has the same appearance of good execution which is remarked in the others.

From this guard-lock the canal proceeds to behind the upper arch, where it is let down by two locks into the old canal, just above the 4th and last guard lock, which has been raised on a former lift lock of the James River Company. The dam at Fore's fish-dam could not be quite completed this year. The work is well done.

I have been particular in mentioning the most prominent works of this section of the canal. As to the numerous details of minor importance, such as wastes, bridges, &c. I can only add, in general, that they have all been made with the propriety and care suitable to their respective objects. The number of wastes might, indeed, have been less; but, on the other hand it may be observed, that they procure an additional security to the canal. The expenditure of wooden wastes is not considerable, and some of them must be considered as a temporary protection, which need not be repaired when the banks shall have acquired all their strength.

There remains only to add, that the line has generally been located with the practical skill which balances carefully the excavation and embankment.

On the Examination of the Canal through the Blue Ridge.

The canal through the Blue Ridge is seven miles in length. It has been divided into three contracts. The 1st, from the North Branch, to the Big Balcony falls; the 2d, from thence to the crossing place, half a mile above the Cushaw Falls; the 3d, on the south side of the river, to the lower extremity of the line, a short distance below Piney Isle. The contractors are all men of known experience.

The work is hardly begun on the two lower contracts.

The upper contract has progressed with remarkable activity: a considerable part of the walls and banks has been raised: the walls are well built, and of good proportions; and in general, so far as the work has progressed, it has been very faithfully done by the contractors.

I observed with satisfaction, that paving at one place had been resorted to, instead of walling. This mode of protecting banks I had strongly recommended in my specifications. Some expense might have been saved by substituting it more generally for the heavy walling that has been built. It is proper to remark here, that the higher a bank, the greater the proportional saving by paving. While the expense of walling increases in a duplicate ratio, that of paving follows the simple ratio of the height of the bank. All other circumstances being equal, for instance, the difference between paving and walling might be about $1 30 a running yard for a bank 12 feet high, while it would be $13 30 for a bank 24 feet high. This is an example of the fallacy of averaging between the two extremities of a section: the calculating of solid contents by this method will always prove very erroneous.

Instead of placing the puddle next to the wall, as is usual near Richmond, it has been removed towards the inner edge of the bank, which I think preferable. In some places, however, instead of forming a vertical wall of clay within the body of the bank, another mode has been pursued, which I think less eligible; it consists in sinking a puddle ditch from the inner base of the bank down to the next stratum of tenacious earth, and then raising a lining of clay along the interior slope of the canal. Puddle in this situation will be more liable to crack, and may be gradually worn away, or otherwise injured.

In general, the course of the puddle is too thick, being sometimes as much as six feet wide. A thickness of clay of three feet would commonly be sufficient when supported by earth on both sides: the difference would produce a saving worth attending to.

The last subject I have to notice, is the width of the canal. In viewing the line, it appeared to me that the width would often exceed that prescribed by law: this was fully confirmed when the subject of the width of the locks was agitated by the board of engineers and commissioners, to whom it was stated by the engineer of the work, as an argument in favor of making them 16 feet wide, that the canal would mostly be 40 feet wide throughout; because the contractors found it necessary to dig further into the hill, in order to get materials for the bank. But, in almost every case, this necessity can only result from an error in laying off the bank too far out, and I can perceive no difficulty to keep the canal within the prescribed limit of 30 feet. By taking numerous cross sections, and balancing carefully every local circumstance, a central line for any canal can always be staked out, so that the excavation will exactly furnish to the embankment; any deviation from this line of least excavation produces an accession of expense; in low grounds like those of James River, it would be absurd to attend very minutely to it; but in difficult grounds, along a steep and rocky declivity, a proper economy recommends the utmost care in adhering as much as possible to the least expensive plan. I do not think that for a bank of 20 feet in height, for instance, the difference between a canal 30 feet wide and one 40 feet, could be less than $4 a running yard, and it might greatly exceed it.

A more careful equalization of the excavation and embankment will bring the dimensions of the canal within the provisions of the act. This requires repeated trials and calculations; but it is only by a critical and unwearied attention to details, that the necessarily considerable expense of a work of this difficulty and magnitude can ever be reduced to its minimum.

Respectfully submitted.
C. CROZET, *P. Eng'r.*

SECOND REPORT,

On the Location of the Canal through the Blue Ridge.

RICHMOND, January 15th, 1825.

Pursuant to the instructions I received from the members ex-officio of your honourable Board, in consequence of the 4th section of the act of Assembly of the 8th of March last, directing *that the civil engineer of this State shall, without delay, locate in such a manner as he may think best, the canal between the Irish Falls and the mouth of the North Branch,* I repaired to the Blue Ridge, as early as the state of the water would permit, to execute this duty.

It then appeared to me, that, in ordering the location of a canal through the most difficult section of the whole line, the phraseology of the law was only intended to designate the points between which a safe navigation must be substituted to the dangerous rapids of that section, but was not so imperative as to require the engineer to sacrifice the propriety and economy of location to the precise extent and meaning of its words.

Impressed with this belief, I formed a pond by a dam up to the North Branch, but took the canal out of this pond some distance below the fork: this appeared to me to answer the present purpose of the law in the most economical manner; as I thought it immaterial whether boats coming down the river did keep a few hundred yards longer in it.

Proceeding down the margin of the river on the Amherst side, which is designated by the law, I found that the present expense of the canal on this side below the Cushaw Falls, would greatly exceed the expense of the same on the Bedford side: that, below the Irish Falls, the place where the boats must get into the river, would be inconvenient, and that the future continuation of the canal on the same side, would present difficulties almost insurmountable. I, therefore, concluded that it would be most expedient to depart from the terms of the law in this particular, and cross over to the Bedford side above the Cushaw Falls. The propriety of this departure from the letter of the law has been generally admitted.

The place, where the river must be taken below the Irish Falls, was left undetermined at that time, as the water was then too high for the selection of a proper site for the last lock, which must be regulated by the low state of the river.

The location, so far as the state of the water would permit, was completed on the 5th of May, when I set out for Richmond to receive your farther instructions. On the 20th of the same month I left Richmond for Clarksburg, whence I returned on the 20th of June.

I understood then, that the commissioner of the Blue Ridge Canal, considering the law as imperative, had caused the site of my dam to be changed, the level to be considerably raised, and the canal to be extended to the North Branch.

The law having specially directed that the location should be made by the civil engineer, I considered myself responsible for the performance of this operation, and I conceived that it would be a neglect of duty, while the work was progressing, to sanction by my silence a change whose propriety I did not admit; whereas my annual report would shew but too late my real opinion.

To remove, if possible, the objection of the commissioner, arising from his strict construction of the law in this particular, might, I thought, be productive of some advantage to the work, and I addressed a report on this subject to the board ex-officio.

In the same report, I also took notice of a deviation from the width of ten feet, I had recommended for the locks, which had been contracted for at 16. feet wide.

When I objected to this deviation, I was under the impression that my duty gave me a greater share in the execution of the works of art than would appear to be the case from the opinion of the attorney general, which was given since.

In consequence of this report, and the commissioner persisting in the opinion that he was bound by law to take the canal out of the North Branch, some difficulty arose which threatened to suspend the work. The commissioner then applied to me "*in the most solemn manner, to re-consider the case, and to extend the canal along the margin of James River to the North River.*" This application I laid before the members ex-officio, and under their direction re-examined the line on the 13th of August, when I saw the river in its low state.

At the time the change of my location was made, the new site of the dam had been selected at the Fork Falls, which is a ledge close to the mouth of the North Branch. The evident danger to which boats might occasionally be exposed in moving near and parallel to the dam towards the entrance of the canal, was my chief objection. I found when I reviewed the line, that the site had been removed about 400 yards lower down, to the Witch Falls, which being more remote from the entrance of the canal, was not so objectionable on the score of danger.

Still my former location appeared to me to deserve the preference, but the commissioner did not think, that, under the law, he could begin the canal any where below the North Branch. In this state of things, the progress or suspension of the work depended on my decision.

I had gone to the full extent of my duty; I had objected to the change. Farther than that, I did not conceive that your engineer, possessing no controul over the execution of the work, could extend his responsibility.

The opinion of the attorney general had presented a clear view of the respective duties of the commissioner and of the engineer, according to existing laws. In this able document, he had by no means determined that the latitude taken by the latter was authorised by the law, and it appeared to be the most prevalent opinion that the law was imperative.

It was also a matter of doubt with me, whether, being called upon by the commissioner not only to re-consider the case, but to extend the canal up to the North Branch, I was not bound to do it under the 5th section of the act of the 8th of March last, and the 13th section of the act of the 24th February, 1823.

The late selection of a safer site for the dam, by which my principal objection was done away, concurring with all the above recited circumstances, I complied with the commissioner's request; advising him at the same time to lower the dam, and, consequently, the new line, which was 11.14 feet high to 9.14; which he agreed to.

He likewise agreed with readiness, to make the locks according to my specifications, and to make the canal three and a half feet deep, as it is near Richmond, in order to allow the same draught of water at both places.

I have been thus particular in explaining my motives for acceding to the changes made, because, if I mistake not, they have not been generally appreciated.

Although this business had acquired an unexpected degree of publicity, I considered it then quite settled. It was, however, revived in November, at the time of the visit of the engineers and commissioners to the Blue Ridge, when the other gentlemen of that Board were requested to give their opinion on the subject of the location and of the locks. This they have done officially.

I regret that I could not concur with them; but I hope that I shall be able to prove, that it was not from partiality of opinion, but from the unyielding conviction of plain mathematical evidence. I will first consider the dimensions of the locks.

OF THE SIZE OF LOCKS.

The majority of the Board of Engineers and Commissioners recommend the locks to be 16 feet wide at the Blue Ridge. On this subject I respectfully submit the following observations:

In the first place, it is obvious that boats cannot be made much wider than about one-half the width of the bottom of the canal for which they are intended; or else they could not pass each other in it. Hence locks, which of course must be a little wider than the largest boats that can navigate the canal, must be about one foot more than half the width of the bottom; or one-third of the surface width of the same These dimensions depend, in some measure, on the draught of water of the boats; which, however, ought not in general to approach nearer than 1 1-2 foot to the bottom of the canal.

Hence in a canal 40 feet wide, the boats may be 12 or 13 feet in width, and the locks 13 or 14.

But in a canal 30 feet wide, the boats cannot exceed 10 feet, and the locks ought not to be more than 10 1-2. (I suppose the draught to be only 2 feet.)

If this self-evident proposition required the support of opinions, I might use that of an engineer of great reputation. Judge Wright wrote to me on this subject, in date of the 15th of August, in the following terms: "On the subject of width and depth of the canal, I should find no difficulty in satisfying my own mind, that the proportion, as mentioned in your letter, of 30 feet canal and 16 feet locks, is very objectionable; the width of 11 feet,* as you proposed to the commissioner, is certainly greater, or as great, as the proportions between canal and lock ought to be. We find by experience on the New-York canal, that our locks, which are 15 feet wide, (and our canal 40 feet,) are out of proportion to the width of our canal. The locks should never exceed one-third of the width of canal; and one-fourth is a better proportion to make boats move more easy. Where we made our locks 15 feet wide on the New-York canal, it was with intention to introduce boats 7 feet wide, after the English plan, and have two pass together. I can now see that the proportion for 15 feet locks ought never to have been less than canal 50 feet surface and 5 feet deep; then, there would be a difference in the power necessary to move a boat 14 feet wide, drawing 3 1-2 feet water, at the rate of 2 1-2 or 3 miles per hour, nearly one-third. This is a matter which is not well understood by theorists, and they only think it important to have very wide locks, so as to have great boats, without having a canal with proper proportional width to make the boats move easy."

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* I had subsequently told the commissioner, that if he preferred it, I saw no great objection to this dimension.

The positive opinion expressed in this letter is also implied in the report of the engineer and commissioners, since they recommend to contract the width of the locks hereafter; hence it appears, that small locks are generally admitted to be preferable. But the report adduces reasons why what is proper in general is not so at the Blue Ridge: To these I will now answer.

The first reason assigned is, that boats 40 feet long and 7½ feet wide are now used, and will probably continue to be so, for many years, and that there is a *great advantage* in passing two boats at one time in a lock.

In my report to the members ex-officio, to the weight of experience which teaches that 5 boats will pass through a single lock while 4 only would pass through a double one, I had added some incontrovertible calculations, which prove that a double lock holds much more water than two single ones, (if they are intended for boats of the same length;) and consequently, that it will take more than double time to fill or empty a double lock.

For instance, a lock 16 feet wide, and of proper length to pass 2 boats 70 feet long, would receive or discharge 10,750 cubic feet of water. A lock 8 feet wide, and of the requisite length to pass a boat also 70 feet long, would contain only 4,920 cubic feet, both locks being of 8 feet lift. It would require, consequently, for venting the water out of the double lock, twice the time of the single one, and one-fifth more.

In addition to this, double gates are at least three times as weighty, and require, consequently, a proportional power or time to be opened; and two boats will probably take more time to get into a double lock, than twice the time taken by one boat to enter into a single lock. Add to this, that frequently one single boat will present itself before a double lock and be retarded as much as if there were two boats, and the advantage of passing two boats in a lock will not appear so obvious.

Yet, all this is not, by far, the most powerful argument against the opinion under consideration. I will even concede, for the sake of argument, that a double lock takes only double the time of a single one; and I will suppose this time to be 5 minutes for the large lock, and 2½ minutes for the small one.

I suppose now, that two boats travelling together have to pass 12 locks, 16 feet wide, which is the number through the

Blue Ridge: they will both be delayed 5 minutes at each lock in all, 60 minutes.

Now, instead of double locks, I suppose single ones to be used; the first boat passes the first lock in 2 1-2 minutes; the second boat, waiting during this time, loses 2 1-2 minutes upon the first, but, of course does not lose any more at the succeeding locks, which are ready to receive it when it reaches them; hence,

The first boat passes the 12 locks in 30 minutes;
And the second boat in 32 1-2 minutes.

So that, instead of an advantage, we find that an undeniable loss of time of 30 minutes for one, and 27 1-2 for the other, would be experienced in passing though the 12 locks, if made double.

Extend this calculation to 120 locks, and the account will stand thus:

Delay from double locks for both boats, 600 minutes,
Delay from single locks, for 1st boat 300 minutes—for the 2d, 302 1-2

Whatever may be the number of boats that may come at the same time, the difference of delay will be the same for each.

And if we now introduce the real difference, as mentioned above, in the ratio of 4 to 5, and suppose, (as I doubt not it would be the case,) that a boat would pass in 2 minutes through a lock 8 feet wide, while 2 boats would take 5 minutes through a double lock; the loss of time by double locks will appear much greater.

Two boats would be delayed through 12 double locks, 60 minutes
And would pass the 12 single locks, the 1st boat in 24
the 2d boat in 26 minutes.

Making for the 2d boat a saving of 34 minutes. But here it is remarkable, that the saving of time for the last boat, from single locks, would in crease with the number of boats that might present themselves together, and would be equal to 33 minutes added to one half the number of boats.

So that, for 2 boats, it would be, as above, 34 minutes,
for 100 boats, 83

These calculations are, I hope, a cleardemonstration of the propriety of my recommending locks 10 feet wide, instead of 16, and of my standing alone against a respectable majority.

A similar and proportional calculation will prove, that boats will pass much quicker through the Blue Ridge through 12 locks, 10 or 10 1-2 feet wide, than through the same number of 16 feet locks.

After having demonstrated that time will be lost, instead of gained, by 16 feet locks, even in the present state of things, it is unnecessary for me to make any remark on the supposed facility, expressed in the report, of contracting the width of locks. Theoretically speaking, it would be easier than widening. I will merely ask, how it could be reconciled with the continuation of an active trade, or indeed of any trade at all?

Locks 16 feet wide would, consequently, be more disadvantageous now, and certainly a great deal more so when boats 10 feet wide shall come to be used on the line; for, then, nearly one half of the water in the lock would be unnecessary, and occasion a proportional delay to each boat. I can, therefore, see no reason to postpone their introduction.

The consideration that they will also be cheaper, and the extent of the saving, are not undeserving of notice.

Although enough has been said above to satisfy every one that there is no doubt of the advantage of narrow locks made of suitable proportions to the canal, I ought not to omit another defect of wide locks: that each boat which passes them, produces in the intermediate basins, a considerable depression or rise; and consequently, a constant oscillation of the water, which is very injurious to the banks.

A body of water of 10,750 feet, being taken by each boat out of a basin of 30 feet in width, will depress it,

If 150 yards long,	about	10 1-4 inches,
If 200	"	7 3-4
If 300	"	5

These quantities under unfavorable circumstances may be doubled and even trebled. Consequently, at the end of the line, a single boat passing the two connected locks, would frequently depress the preceding basin, which will not exceed 400 yards, as much as 8 inches; whereas, through locks of 10 feet, it would not produce a depression of more than 5 inches.

It is true, that in England two boats are sometimes made to pass through a lock, and the cases when this is done, might perhaps authorise an imitation of the plan, if not explained. There are many instances in England, of small and secondary canals communicating with large ones; and it is common in those cases to make the boats in the smaller canals such, that when they enter the large one, two of them may pass at a time through the wide locks of the large trunk. In no other case is this plan eligible.

It appears that wide boats are an advantage to the coal trade; and, therefore, the canal being 40 feet wide near Richmond, and admitting of locks 14 feet wide, there was some propriety in adding 2 feet to this width, in order to pass two of the James River batteaux together; but above, none of these circumstances exist.

For all the foregoing reasons which I had duly weighed at the time of the location, I had recommended locks 10 feet wide and 75 feet long. I think, however, now, that 10 1-2 feet would be more eligible. The commissioner of the canal had agreed to it; but the opinion of the majority of the Board of Engineers and Commissioners raised new doubts in his mind. I hope, however, that my present arguments will as successfully convince him, as those I used in June last had done, that my opinions were founded both on experience and critical investigation.

As the attorney general appears to incline to the opinion, that under the law, the works of art, such as locks, dams, culverts, &c. are entirely to be regulated by the commissioner, the decision of the question rests with the latter. I was to have furnished him, upon his application, with plans of locks of suitable proportions to the legal width of the canal, when he again altered his opinion, and I was compelled to object a second time, to dimensions of whose inexpediency I am so fully convinced.

I must not omit to state, that as to the idea, that the canal may hereafter be made 40 feet wide, the law under which I acted did not authorise me to make such a supposition; but, besides, I question much whether, even in that case, the locks need be larger; for boats 10 feet wide and 70 feet long, may load 35 tons; and I doubt whether more will ever be wanted. As to myself, I would not even advise these heavy burdens: 25 tons seem to be the load generally admitted to be best calculated for canal transportation.

As too much light cannot be thrown upon this important subject, the decision of which will probably influence the whole line of the canal, I beg to complete what I have said about the size of locks, by the following extract from the report of this year on the Union Canal:

"The canal is 24 feet wide at bottom, 36 at top, 4 feet deep, locks 8 1-2 feet wide.

"The navigation originally contemplated upon this line, was for boats to carry from 7 to 10 tons; and after some alterations, is now calculated for boats carrying from 20 to 25 tons, being the best average load for one horse, to be moved at the usual canal rate of from 2 1-2 to 3 miles an hour. A navigation of this kind is believed to be the most convenient and profitable. The proportion between the width of the locks and canal is conformed to the most approved principles. It was decidedly recommended by Mr. White, the engineer of the company, whose opinion was sanctioned in the fullest manner by that of Benjamin Wright, esq. chief engineer of the Erie Canal, and now holding the same station on the Chesapeake and Delaware Canal, and by the late Thomas Oakes, esquire, of the Schuylkill Navigation Company. Guided by the judgment of men, whose talents, skill, and experience are so well known and acknowledged, the Board feel every confidence that their decision will be found correct, when tested by experience. Were it needful to resort to examples, it might be safely asserted that some of the most useful and profitable canals abroad have locks of smaller dimensions than those adopted by this Board. It is also emphatically remarked, in the report on the canal through New Jersey, where a small navigation is recommended, that experience has gradually led to a reduction in the size of canals, and of the vessels which navigate them. The late Mr. Fulton, who was a warm friend to canals, refers particularly to a 25 ton navigation, in his letter to the Secretary of the Treasury. Indeed, the facility of moving a narrow boat through the water, is so much greater than a wide one," &c. &c. &c.

I have brought forth indisputable arguments and authorities, which establish clearly, that locks from 10 to 10 1-2 feet will save time, under every circumstance; that they are less expensive; that they do not occasion so injurious a depression of short intermediate basins; that they are in true proportion to the width fixed by law for the whole canal; and, finally, that they will pass boats even more heavy than those generally allowed to constitute the most eligible canal navigation. I hope, therefore, that they will receive the preference.

I proceed now to explain the various views and particulars of the location; they may demonstrate that there was, at least, some propriety in a slight departure from the letter of the law, while its spirit was complied with.

ACCOUNT OF THE FIRST LOCATION.

Although I owe to your honorable Board an account of every official transaction wherein I have had an agency, I would probably not have dwelt minutely on the merits of the several locations of the canal at the Blue Ridge, had not the report of the Board of Engineers and Commissioners appeared with an unexpected underscoring of the words "*at present*," in the opinion given upon the request of the commissioner of the Kanawha Road and Navigation, by the gentlemen, who, together with myself, constitute that Board, "that the canal at the Blue Ridge is *at present* judiciously located."

This essential modification of the sentence is too pointed for me to subscribe to the opinion it implies; and whether intentional or accidental, it cannot fail to convey a decided, though not explicit, reference to my former location.

To this, therefore, I find myself compelled to answer; and I flatter myself, that here, as in regard to the locks, I shall be able to prove, by a full and clear demonstration, that, in a professional point of view, my location of the canal was made with due deliberation and propriety.

The part which was modified by the new location, extends from the North Branch to about 100 yards below the Big Balcony Falls, a distance of 1 1-2 miles.

The ground was mostly covered by the work when the gentlemen saw it, except near the Little Balcony Rock, where on the level I had chosen, there would have been about 1,000 cubic yards of rock to remove, which, however, would build but a small portion of the immense quantity of walling that upholds the canal. This, though a solitary case, may probably have been taken by them as a sample of the blasting that a low level would have produced : if so, the implied opinion was, undoubtedly, correctly conceived : but, with due respect, I beg to observe, that this would not have escaped my notice.

My field-book, which exhibits all the levels, together with numerous cross sections, and a minute description of the ground, would have conveyed, if consulted, nearly as correct an idea as might have been formed from the ground itself before it was concealed by the canal. From this field-book, therefore, I have prepared, with great care, plans and cross sections, with profiles, shewing the relative position and dimensions of both lines of canal. These diagrams present a comparative view of the quantity of excavation, walling, paving, &c. at each successive station. I have the honor to lay them before you; they will elucidate this report.

Every thing relative to the first location, or low level, is designated by red lines or marks.

Preliminary Examination.—Upon a view of the ground, I remarked, that about 1 1-2 miles below the fork of the North Branch and James River, the Big Balcony Falls and the perpendicular rock which there projects into the river, would present the principal difficulty for some distance. There is at that place an abrupt fall of four feet.

Considering, therefore, that when the level of a canal cannot be carried over a cliff, it ought to be kept as low as possible round it; and it appearing that freshets do not rise any where over 15 feet through the Blue Ridge, and must certainly not rise so high immediately at the head of a cataract, I concluded, that to pass the Balcony Rock upon a surface level of between 14 and 15 feet, would be amply sufficient, especially when it is recollected that the bank or wall must be at least three feet higher than the canal, that is, 17 or 18 feet above the river.

The necessity of building a wall there, and the consideration that the expense of a wall is in a duplicate ratio of its height, advised also this level as more economical. The ratio of expense, for instance, between a wall 20 feet high, and one of 27 feet, would be as 400 to 729; so that the cost of the former, being $22 70 a running yard, that of the latter would be $41 40.

The expense of embankment increases pretty nearly in the same ratio.

Levels.—I next tried the level from the Fork to the Big Balcony, in order to ascertain the best site for a dam to raise the water to the height I intended. This operation occupies the 1st and 2d page of my field-book: it gave the following result:

From the Fork to the Witch Falls,	21 chains,	1.88 feet fall,
Thence to the Flat Rock Falls,	30 ch.	1.34
Thence to the Little Balcony,	47 ch.	6.00
Thence to the Big Balcony,	15 ch.	2.85

Making in all, a fall of 12.07 from the Fork to the Big Balcony.

I conceived, therefore, that a level of about two feet above the Fork would perfectly answer my purpose.

The Dam.—It is always important to take the water out of a river at the head of a great fall, in order that the level of the canal may be as soon as possible out of reach of the river. By looking at the above numbers, it will appear that the fall from the Fork to the Flat Rock is little; but that it increases immediately below it: hence, the Flat Rock ledge is at the break of the slope of the river, and would be the most advantageous site in this respect. The water is shallow over the ledge.

There I took a level which, at low water, proved to be 5.77 feet above the river, and backed it up 2.55 above the water at the Fork. This level was also about half a foot above that of the deep still water of the North Branch above the shoal at its mouth, and it passed the Big Balcony 14.65 above the head of the fall.

By this means, it is evident that the walling which, for any level, must be built nearly all the way down to the Big Balcony, would have had only the indispensable height necessary to keep out freshets; and that a pond was formed to above the mouth of the North Branch, which I thought complied with the spirit of the law, especially as, until the canal shall be continued, the boats must come down the river through much worse water.

Lower entrance.—I placed the entrance of the canal about 140 yards above the dam, at a small run, which, by this means, would vent itself out, without interfering with the canal. On the present level, it will require an expensive culvert; or it must be received into the canal, which is very objectionable, because the level being low, no waste can be made opposite to it, since a cut through the high bank of the canal would expose it to the invasion of freshets.

Jetty and upper entrance.—Although the current bears evidently towards the entrance I had selected, I was aware that, at high water, imprudent boatmen who should neglect to come to the shore some distance above the entrance, and let their boat down along the level beach, would be exposed to some danger. They had, however, three-quarters of a mile to take their measures; and yet, though it is impossible to guard against every case of imprudence, I had, nevertheless, located partially for this purpose, and also to exclude drift timber from the canal, a jetty above the entrance, and nearly parallel to the shore. This jetty might have been extended up to any necessary distance. The relative position of all these things is represented on the map.

By making the ground behind the jetty, about level with the pond of the dam, it is obvious that the river would rise over it in a swell of from 3 to 4 feet, and that then the boats might pass behind the jetty, and, under its protection, get to the mouth of the canal.

In limiting the pond of the dam to a short distance above the Fork, I had in view the protection of the low grounds above, without losing sight of the future continuation of the canal.

In regard to this subject, I will observe, that when the canal is extended upwards, the North Branch must be crossed either upon an aqueduct, or in its own bed. In the case of the preference being given to an aqueduct, it cannot be denied that the foundation of its piers and abutments, in a depth of 8 or 10 feet of water produced by a high dam, will present difficulties which would not exist in the usual depth of the river. Moreover, the aqueduct itself will have to be made higher.

If the North Branch should be crossed through its bed, the lock by which the canal must be let down into it, may present considerable difficulties of foundations in or near a deep pond of water. As to the route from the North Branch to the entrance which I had projected, I think that the pond of the dam would have answered every purpose at all times; since the water, in rising, would have merely ascended to its successive heights up the declivity of the alluvial field, which extends from the North Branch to the intended beginning of the canal. Along this field, I think that boats might have moved in perfect safety; for, I do not suppose the current can be very strong along alluvial ground.

But, even if at any time afterwards, it had been deemed necessary to make a canal along this field, a ditch having its bottom nearly on a level with the pond of the dam might have been excavated up to the North Branch. This ditch, dry in the summer, when the pond of the dam might safely be used, would have been filled in a rise of three feet, and might then have answered the purpose of a canal to convey boats safely to the entrance below.

This I mention only to show the facility of connecting the canal, such as I had planned it, with the North Branch; but

I do not think that either for the present, or even afterwards, this expense would have been found necessary.

2d Dam—The dam was in the first instance removed by the commissioner to the Fork Falls: It was the site I objected to, as being too near the North Branch, and the contemplated entrance of the canal.

3d Dam—The dam was subsequently located at the Witch Falls, about 450 yards below the Fork. The intended height of the dam was then 11.14 feet. Under the new point of view which was presented of this business, viz: that the entrance of the canal *must be* at the North Branch, this was the best site that could be selected; but the dam appeared to be unnecessarily high.

The inconveniences of dams, and especially of high ones, are well known: These are sometimes resorted to in order to save deep cutting; but in the present case, there was no such circumstance to justify the erection of so high a dam. It was lowered by two feet upon my suggestion, and will now stand 9.14 feet high. Its length is about 600 feet, though the river itself is there only 430 feet wide; but the dam must be extended across the dry land, which it will overflow, and there be partially raised to a height of about 20 feet, for the more effectual protection of the part of the canal immediately adjoining and below the dam.

This difficulty did not exist where I had located the dam: —The canal would have been naturally protected by the wall, which at all events must be built round the flat rock cliff, and which would thus have answered a double purpose.

After having set forth the various principles and considerations which had directed me in the preference I had given to the first location, it remains for me to shew what degree of economy might have resulted from it.

In the first place, my dam was about 600 feet long, and 5.77 high, and need not be higher any where; since, as just stated, its abutment next to the canal would rest against a solid wall; and, therefore, the canal stood in no danger to be rooted up.

At the present site, the dam could not be made lower: It will have nearly the same length, and be 3.37 feet higher, for about 500 feet; and the part adjoining the canal, must be raised to a height of at least 20 feet for a distance of not less than 100 feet. This will produce, at high water, a diminution of the width of the stream, which is somewhat objectionable, especially when in addition to the obstruction produced by a high dam.

At the Fork, a jetty must be erected above the entrance of the canal, to protect it against drift timber.

From the Fork to the dam, there must be a high embankment about 12 feet above the surface of the canal, or else the bank would frequently be under water; and if so, it might as well not be made at all, which in fact might be advised, at least in part. The length of this high bank is about 450 yards.

From the dam to my intended entrance, (500 yards,) the bank must keep about 17 feet above low water, and consequently about 8 feet above the surface line of the canal. The whole of this my location did not require.

Thence for 500 yards, both lines of location require the same high embankment, and if located alike, the lower line might be a little more expensive than the higher one.

From the end of these 500 yards, the bank of the higher level rises gradually for a distance of 750 yards; at the end of which, it attains its superior height of 4.71, which it retains to the 1st lock, that is to say, for 200 yards more; and every body knows how rapidly an increase of height will augment the expense of walling and embankment.

As to the Little Balcony Rock, on the low level, it would, as mentioned before, require some blasting; but the stone proceeding therefrom, would find a place in the walling; and yet such is the influence of higher walls and embankments, that the expense of the higher level will even there be greater, as appears from the estimate below, which has been very carefully made from an accurate measurement of the rock and ground about it, recorded in pages 49 and 50, of the field-book. This estimate is illustrated by a separate plan, and several sections of the cliff and both lines of canal.

The following is a comparative estimate of both locations; it has been predicated on the evidence of plans and sections obtained from my field notes; such documents are the only true criterion of an engineer's opinion.

I have divided the distance comprised in these estimates, (116 chs.) into 6 sections. The contract prices have been taken as a basis.

A COMPARATIVE ESTIMATE OF THE

PRESENT LOCATION.

	Cubic yards.	Cost.	Total amount.
1st section—From the entrance to the dam at st. 11—450 *yards.*			
For a pier head,		900 00	
Excavation and embankment, *a* 25 cts.	11724	2931 00	
Paving round the head of the bank,		200 00	
			4031 00
2d section—From the dam to the Flat Rock—690 *yards.*			
For a dam 500 feet long, 10 ft. from bottom,		7500 00	
For a wall 100 ft. long and bank,		2000 00	
Guard lock,		8500 00	
Excavation and embankment from the dam to No. 1, 1st location, *a* 25 cts.	15028	3757 00	
For paving the bank from st. 14 to st. 18, *a* 75 cts.	990	769 00	
For walling from st. 18 to st. 1, *a* $1 36,	1079	1467 44	
For a culvert,		2200 00	
			26193 44
3d section—From st. 1st to 15—*a distance of* 500 *yards.*			
For walling, *a* $1 36,	4583	6232 88	
Paving, 75,	1108	831 00	
Excavation, 18,	940	169 20	
Embankment, 25,	11676	3919 00	
Puddle, 40,	1665	666 00	
			11818 08
Carried forward,			$42042 52

FIRST AND SECOND LOCATION.

FIRST LOCATION.

	Cubic yards.	Cost.	Total amount.
For a dam 630 ft. long, 6 1-2 ft. above river bottom,		6300 00	
For excavation and high embankment from 61 yards above 16,	1516	379 00	
Paving the same on both sides,	448	336 00	
For a pier head from 16 to the river above the summer entrance,		2000 00	
Excavation and high embankment from the entrance to the guard-lock, *a* 50 cents.	2588	1294 00	
For a guard-lock,		8500 00	
			18809 00
For walling, (the guard-lock occupies a part of this distance,)	4295	5841 20	
Paving,	1120	840 00	
Excavation, *a* 19 cents,	7269	1381 11	
Embankment, 25	4860	1215 00	
Puddle, 40	544	217 60	
			9494 91
Carried forward,			$28303 91

Present Location.	Cubic yards.	Cost.	Total amount.
Brought forward,			42042 52
4th section—From st. 15 *to the Little Balcony, at st.* 24—460 *yards.*			
Paving from 15 to 17, *a* 75 cents,	480	360 00	
Walling from 17 to 24, *a* $1 36,	5113	6953 68	
Embankment, 27,	10296	2779 92	
Excavation from 15 to 22, *a* 18 cts.	526	94 68	
Excavation from 22 to 24, (used in walls or bank,)	730	0 00	
For puddle, *a* 45 cents,	1922	864 90	
For a culvert,		1500 00	
			12553 18
5th section—From 24 *to* 27, *through the Little Balcony Rock*—97 *yds.*			
For blasting, *a* 25 cents,	192	48 00	
Embankment, 30	2661	798 30	
Walling, $1 36	1540	2094 40	
Puddle, 45	619	278 55	
			3209 25
6*th section—From* 27 *to B.* (60 *yds. below the Big Balcony,*) *a distance of* 347 *yards.*			
Walling above Big Balcony *a* $1 36	4783	6504 88	
Do below do. to B. "	1556	2116 16	
Excavation, (1-4 requiring blasting,) *a* 25 cts.	1114	69 82	
Embankment above and below the Balcony, *a* 33 1-3 cts.	10926	3642 00	
Puddling, *a* 47 cts.	3142	1476 74	
It may cost to pass round the Big Balcony,		2800 00	
			16609 60
For 4.70 ft. of additional lockage,			4700 00
Total amount of high level,			$79114 55

First Location.	Cubic yards.	Cost.	Total amount.
Brought forward,			28303 91
Paving from 15 to 17, *a* 75 cts.	460	345 00	
Walling from 17 to 24, *a* $1 36,	4555	6194 80	
Embankment, *a* 27 cents,	3331	899 37	
Excavation from 15 to 22, *a* 19 cts.	6014	1142 66	
Do. from 22 to 24, (say ¼ requiring blasting, *a* 25 cts. all employed,)	1492	93 25	
For puddle, *a* 45 cts.	1523	685 35	
For a culvert,		2200 00	
			11560 43
For blasting, *a* 25 cents,	736	184 00	
——— 50	360	180 00	
Embankment, 30	1885	565 50	
Walling, $1 36	1178	1602 08	
Puddle, 45	593	266 85	
			2798 43
Walling above the Balcony,	3052	4150 72	
Do. below do.	1109	1508 24	
Excavation, (1-2 requiring blasting,) *a* 25 cts.	2412	301 50	
Embankment, *a* 33 1-3 cts.	5847	1949 00	
Puddling, *a* 47 cts.	2483	1167 01	
It may cost to pass round the Big Balcony,		2300 00	
			11376 47
Total amount of low level,			$54039 24

Total amount of high level brought forward,	$79,114	55
Total amount of low level brought forward,	54,039	24
Difference,	$25,075	31

The introduction of contingencies will still increase the abovementioned difference.

Below the point to which this estimate has been carried, the expense of the two locations would be the same.

The result exhibited by this table is such as might have been expected from a longer line, a higher level and dam, and more lockage.

Opposite to the items of excavation of rock, I have not carried full prices. This would have been a double charge, since the materials must be employed in the walls and embankment, which have been estimated in full.

The 3d section is somewhat less expensive on the low than on the high level, though it ought to be the reverse; this is principally owing to the location of the bank of the lower level following more closely the line of least excavation.

It might perhaps be presumed that the excavation of the lower level, in the 3d and 4th sections, where it has been estimated at 19 cents, might occasionally strike upon rock; but, even admitting that one half of all the excavation charged at 19 cents should be through rock requiring blasting, the whole quantity of such excavation being 13,283 yards, one half of it, at as much as 50 cents, would only produce an accession of expense of $3,326, which would yet leave a considerable balance in favor of the low level.

This supposition, which is altogether gratuitous, is, besides more than balanced by a similar consideration relative to the deep cutting between the North Branch and the Flat Rock. My estimate of this part has been predicated upon the calculation of cross sections in which the excavation and embankment are correctly balanced, and consequently, it is as cheap as possible. The sections shew an average depth of 8 feet. But if, as is not unlikely, rock should be encountered before getting to this depth, more expense must be the consequence. In one word, no canal can be open, without being low at its beginning, and occasioning thereby, some extra expense.

It will appear from the profiles, that, as must have been anticipated, the influence of the high level becomes very considerable towards the end of the line.

I regret exceedingly, that I have been compelled to occupy so much of your attention with this truly unpleasant subject; but the evident reflection upon my location, was of too much weight to be answered as a common matter of opinion, especially when the subject admits of positive demonstration. I should have been very unwilling to advance and maintain my opinions without the support of sound principles: The authority I have called to my aid is unerring; it is the clear light of mathematical truth. To relinquish the conviction, I had derived from such evidence, would have been a complete sacrifice to mere opinion of the very circumstances which essentially stamp the advice of an engineer, with a character of certainty and usefulness.

PRESENT LOCATION OF THE CANAL.

The canal as at present located, is intended to begin at the North Branch, on the north side of James River; it will proceed along its margin for 4 1-3 miles, to a point about half a mile above the Cushaw Falls.

There it will cross the river, in its own bed, and be resumed on the other side, where it will be carried along the margin of the river down to the lower end of Piney Island, a distance of 2 3-4 miles; for part of this distance, the canal will be in the bed of a natural ditch.

Immediately below the Irish Falls, there is no good site to lock down into the river, unless three locks be connected together, which is objectionable. The canal must, therefore, be extended lower down, through a field where the cutting will be easy, to beyond a run, immediately after having crossed which the canal may take its direction towards the river. This extension is only 660 yards and through good ground; it will not add any lockage.

The commissioner has suggested that by locking down into the river below the Irish Falls, a loss would be sustained, when the canal is continued downwards, of the cost of the locks, as then they would be perfectly useless. He has proposed to extend the canal to Waugh's Ferry, about 3 1-4 miles farther. I think, that locks opposite Waugh's Ferry would be useful at all times, but for another reason than that assigned by the commissioner: There is from the Cushaw Falls, and almost all the way down to Waugh's [illegible] range of cliffs along the margin of the river; consequently, Waugh's Ferry is the first opening for the trade of the north side of the river, and, indeed, there is now a road leading through it. Locks opposite the ferry, would, therefore, be at all times an accommodation to the trade of the north side.

Entrance at the North Branch.—The water is to be introduced into the canal on the north side of the river by means of a dam, to raise the river 9.14 feet, located at the Witch Falls. This dam will be about 600 feet long including abutments.

In order to exclude the high water from the canal, a guard-lock will be connected with the abutment of the dam.

The canal bank below the dam being within reach of the river when high, the abutment adjoining the guard-lock must be made about 20 feet high for a distance of 100 feet.

At the entrance of the canal, if extended quite to the North Branch, and on the upper side of it, a pier of about 30 yards long, must be erected oblique to the current of the North Branch, and high enough to exclude drift from the mouth of the canal.

Crossing Place.—The canal is to be lowered into the river half a mile above the Cushaw Falls, by two locks which must be connected, in order more effectually to prevent the invasion of freshets.

As the water is deep, and there is no fall in the river for about 500 yards, no dam need be erected, and boats will cross in the bed of the river, which is there 153 yards wide, but increases in width below.

An aqueduct would undoubtedly have been the safest way to cross the river; but its cost would have been considerable, and besides, much expense must be added on the north side, by the necessity of keeping the canal on a sufficiently high level to pass over the aqueduct; and a still greater accession of expense would have been incurred on the south side, on account of the level being thrown high up a steep and rocky declivity, along which the canal must have been held up for a considerable distance before it could have been lowered to an eligible level.

A dam across the river would have occasioned an additional expense without rendering any real service; since, at low water, boats will now cross in a natural pond, and during dangerous freshets, if they came down at all, the pond of the dam would no more exist.

To erect a bridge a short distance above the crossing place, where the river is narrow, will, it is thought, answer a better and double purpose. By means of the bridge, the boats may be towed across, and, besides, its expense may in the course of time be more than compensated by considerable tolls; as there can be no doubt but this route will be much travelled when the canal is made, being both shorter and more level than any other gap through the Blue Ridge.

South Entrance.—The entrance of the canal on the south side, is through a natural ditch, at the very foot of a steep and rocky hill. There, the bed of the canal must be blasted out of the solid rock, for a considerable distance; but, on the other hand, the stone proceeding therefrom, will be useful on the spot to form a protection for the canal on the river side.

The guard-lock being located about 32 chains below the entrance, at the place where the cutting is deepest, a tight bank need not be made before reaching it. The stones must be merely piled up in a somewhat regular manner to keep out drift. There being no fall from the entrance down to the guard-lock, it is rather an advantage that the bank should not be tight.

In order to afford some additional security to boats, it might be advantageous to leave below the entrance, two other openings through the pile of stones, about 20 feet wide, two feet above the level of the water in the canal; and about 300 yards from each other. In a swell of the river, the water would rise through these openings; and if, by accident, a boat could not get in at the usual entrance, it might come through one of those openings. It would, also, be a good precaution to place the larger stones outside, and to arrange them in the way of steps, in order to facilitate the landing of boatmen in a moment of danger.

With the help of the bridge and these precautions, it is probable that accidents will never occur, especially as there is no prominent rock in the river for a considerable distance, and this is a place whereat, in a common swell, boats are in the habit of crossing.

A small distance below the guard-lock the Cushaw Falls begin. These falls are 15 feet in a very short space; so that about 500 yards below the guard-lock the canal will be out of the reach of freshets.

The river is to be taken below Piney Island by two connected locks as above.

Division of the Fall.—The fall on the north side, will be now 60 feet; that on the south side, 37 1-2.

In consequence of the several changes which were made in the level, the locks had to be modified; the last diminution of 2 feet of the height of the line made it practicable and expedient to reduce the number of locks from 8 to 7.

The level of the canal is lowered by locks only after having passed the Big Balcony. The distance of the locks from the entrance, and their respective lifts, are intended to be as follows:

	Distance.	*Lift.*
1st lock,	117 chains,	9 feet.
2d lock,	141	8.75
3d lock,	167	8.50
4th lock,	257	8.50
5th lock,	328	8.50
6th lock,	347	8.50
7th lock,	connected with the 6th,	8.25

The two last locks ought to have the same lift, and their angle with the current should be about 45 degrees. I would propose a slight alteration in the division of the fall which would make the lifts successively, 9—8.90—8.80—8.65—8.65—8—and 8.—

On the south side, the fall will be overcome by 5 locks.

The 1st lock,	at about 131 chains,	its lift,	8 feet.
2d lock,	179	"	7.90
3d lock,	200	"	7.70
4th lock,	225	"	7
5th lock,	connected with the 4th,	"	7

It will be perceived, that in the foregoing division of the fall, I make a greater difference between the two connected locks and the preceding one, than between the others; this is done in order partially to compensate the depression that may occasionally be produced in the intermediate basin, by the drawing of a double lock-full at once out of it; and also in consequence of the following comparison of the expense of water between single and connected locks.

			A boat passing through a single lock	Two connected locks.
Will draw if it finds them	Empty	in ascending	1 lock full	2
		in descending	1	1
	Full	in ascending	1	1
		in descending	0	0
Total number of lock-fulls,			3	4

Hence, upon an average, the intermediate basin will receive 3 locks-full, and lose 4 from the passage of 4 boats. This difference will be in part supplied by the proposed division, and the balance may be often entirely compensated by a careful attention, on the part of the lock-keeper, to let as much as possible, the boats going the same way succeed each other through the two connected locks.

Dimensions of Canal.—The width of the canal is fixed by law at 30 feet. The depth I had recommended to be 4 feet; but, upon consideration that the depth near Richmond is only 3 1-2 feet, it was agreed to make it the same at the Blue Ridge.

The width of the tow-path is to be 10 feet.

The slopes inside, 2 horizontal to 1 perpendicular, according to contracts. The earth being tenacious there, I had recommended 1 1-2 to 1, which would be more economical. The height of the tow-path above the surface of the water, is to be 2 feet: it will be proper to make it at least 3 feet from each entrance to each 1st lock, whose gates must also be made higher.

For 1,600 yards on the north side, and 1,100 yards on the south side of the river, the height of the bank must be regulated by the greatest height to which the river is known to rise, which it ought to exceed by 2 feet: 17 feet on the Amherst, and 16 on the Bedford side, will probably be sufficient.

Where the bank is in danger to be abraded, it will be protected by walling or paving. The proportions adopted for the walls are one-fourth at top, and one-half at bottom, of their height. A small offset 2 feet deep, and leaving a width of 3 feet to the top of the wall, would be proper, to make the smooth part of the tow-path wider. The paving is to be 1 1-2 feet thick. These two items of expense will be very considerable.

North side.—On the north side, if the entrance of the canal must be exactly at the North Branch, a pier-head must be erected to protect it; and a guard-bank must be made from there to the dam, not less than 12 feet above the level of the dam.

The cross sections I have made of this part, and laid before you, shew what the least cutting will be. But, the excavation will be more, if ledges of rock should not permit to go to the required depth of 8 feet, which is averaged by the line of least excavation. In this case, the depth of cutting must be diminished by removing the line lower down the declivity, and then the embankment must depend on the width for materials, which could not be obtained in depth. But, it is obvious, that, by being removed lower down the slope of the ground, the height of the bank, which must remain the same above the level of the canal, would be increased in regard to the ground; and, because the accession of expense produced by an addition to the height of a bank of earth, is a stratum at its base, and not at its top, it follows that a few feet may double the cost of embankment. This is exemplified by the section of station 18, wherein the removal of the bank, a distance of only 8 feet down a very gentle declivity of only 10 degrees, adds more than 50 per cent. to the contents of this bank.

So that the excavation of the first section from the North Branch to the dam, if it became necessary to reduce it from 8 to only 4 or 5 feet cutting, might actually be doubled, and raise the expense of the high embankment from $3,000 to perhaps as much as $6,000. If, therefore, this high bank was not extended upwards more than about 100 feet, there would be a considerable saving in pier-head and embankment. As for myself, I think that the entrance would be as safe, if not safer, by being more remote from the confluence of the two rivers; for, if boats, in any state of the water, can reach the entrance at the mouth of the North Branch, and, indeed, move some distance up it, they could as easily come to the same point, and drop down along the field, without any guard-bank; particularly since the high abutment next to the guard-lock will produce a pond, by which the approach to the guard-lock will be made perfectly safe. At any rate, since the excavation, being deep, will take place at a point to which the water will not rise, this expenditure might be delayed until the effect of the dam shall have been tried. This I suggest, with due respect, with the hope that it is not in contravention with the law. The map will fully illustrate this idea.

Between the two connected locks, on either side of the river, and each preceding lock, I think that the basin ought to be made 4 feet deep, in order to allow for the great depression which may be occasionally produced in it by double lock-fulls taken out of it at one time.

Of the works of art.—The works of art on this section will be, 1 dam; 2 guard-locks; 12 lift-locks; 2 canal bridges immediately below each guard-lock, to transfer the tow-path from the lower bank to the hill-side; some wastes, and culverts. Some fords will also be advisable, there being a sufficiency of stones to make them. They will be more permanent than bridges, as well as less expensive.

Being as yet unacquainted with the intentions of the commissioner, in regard to these works, none of which are in progress, I can give no farther account of them.

I have remarked in the report of the commissioner of the Kanawha Road and Navigation, that he adverts to his receiving no estimates of the quantity of work in walling, embankment, excavation, &c. to be done. In doing this, I feel confident that the commissioner did not observe that it might be construed into a charge of neglect of duty. As his intention might be mistaken by persons less acquainted with the nature of the duties of the principal engineer, I beg leave to state, through the medium of your honorable body,

That the special law under which I acted, did not require estimates from me.

Moreover, without inquiring whether such estimates would have rendered any real service, I will only add, that the silence of the law on this subject confirmed what is known to be the duty of your engineer, unless otherwise specially directed, viz: to survey and make estimates before a work is undertaken, in order to ascertain its expediency; but after the work has been determined on, the making of estimates devolves upon the person entrusted with its execution.

I should rather have considered it a neglect of duty to exceed, in this instance, what was required of me, while I had so many other important and pressing operations to attend to. In making his estimates by the unit of measurement, the commissioner adopted the only practicable course to carry on, with success, a work of this magnitude, through so rugged and difficult a section, where lumping contracts might repay honorable industry and useful enterprise by total ruin.

Very respectfully submitted,

C. CROZET, *P. E.*

REPORT

OF THE

COMMISSIONER

OF THE

JAMES AND JACKSON'S RIVER CANAL;

To the General Assembly of Virginia.

In conformity with an act making more effectual provision to carry into effect the act entitled, "an act to amend the act entitled, 'an act for clearing and improving the navigation of James River, and for uniting the eastern and western waters by the James and Kanawha Rivers, and for other purposes,'" the Commissioner of the James and Jackson's River most respectfully reports:

That the portion of the canal which is to receive its supply of water from the river at the upper mouth of Tuckahoe Creek is finished, except the dam; about one hundred feet of which is yet to be made. This is principally to be ascribed to the unparalleled state of the river, which it is believed has been above low water-mark for the last twelve months, with the exception of between twenty and thirty days in the months of August and September. If this state of things could have been anticipated, the contractor might perhaps have provided a larger force at the only time which was allowed by the tide; but, having an unprofitable job, in consequence of this evil, which has retarded his operations for two seasons, and having employed no more hands than would work with advantage, this short period was lost without the work being completed. The canal is, nevertheless, filled from Tuckahoe Creek; and so far appears to stand well, and little or no apprehension is entertained of its giving way. There is yet some fencing to be done in this portion, and some money to be paid for condemnation of land under particular circumstances. The portion from Wickham's bridge to Maiden's Adventure, is very far advanced towards completion. The excavation may be said to be done, except some small blocks of earth, left for the convenience of the farmers, where their bridges are not made; and except the bodies of earth, which, in some places, have slipped down from the hill-sides, and left fissures in the earth above. The contractors were allowed to leave them last spring, when the earth was generally wet, in the belief that it would cost less labor to take them out when it should become dry. We are now engaged in removing them; but, it is to be feared that they will continue to come down, till their weight is so reduced as to allow them to rest upon their foundations. The sand washed from the hills has been more considerable than was anticipated; insomuch, that, in some instances, we have resorted to the expedient of excavating circular basins, to be separated from the canal, at its margin, by a water-tight wall to the surface, so that the sand may be precipitated to the bottom of the basin, whilst the water will flow over the wall; this sand to be occasionally thrown over the wall into boats, and carried to the most convenient place where it can be gotten rid of. In some few places, where the valley through which the sand is conducted is so precipitous as to leave no room for basins, we will make the experiment of cast iron cylinders, placed exactly opposite, at the bottom of the canal, through which, by means of a gate which can be hoisted at will, we expect to get rid of a great portion of it. This effect will be occasionally aided by the use of broad hoes, after reducing the water in the canal. The culverts and aqueducts are all done, except the parapet walls of the Tuckahoe aqueduct, which have been arrested by frost, and cannot safely be laid till the next spring. The two last dry walls are far advanced, and will be finished in the course of the winter. Considerable progress is made in the guard-lock at Maiden's Adventure; but little is done to the waste at Beaverdam Creek.

The same evil which prevented the completion of the lower dam, viz: the very unusual continuance of high water, has also impeded the progress of the contractor for the dam at Maiden's Adventure. The abutments and lock are done, as well as a wall to connect the north abutment with the guard-lock; and the greater part of the materials for the stone and timber part are prepared, and a small portion of it put up. Under these circumstances, considering that every thing else will be ready before this can be done, and that the commissioner next season will have but few subjects to occupy his attention, your commissioner has thought it unadvisable to leave it to the tardy operations of a contractor. He has, therefore, declared the contract forfeited, settled for the work done, and materials on hand, and taken it into the care and management of the James River Company, to be finished by public hands; by which means a large force may be put upon it as soon as the state of the river will admit of it, and the canal put in operation as soon as it can be finished.

The pavement of the banks above Pleasants's Island, as reported last year to be necessary to prevent abrasion from freshes, has not been commenced this year for the same reason that interrupted the building of the dams, viz: the continued swells in the river which would have caused much more trouble and difficulty in laying a foundation in the margin of the river to rest the pavement upon, without which there would be always danger of undermining, which would cause it to tumble down, and indeed it was thought advisable, that the banks should have time to settle and become compact, before this operation should be performed. It is also perceived, that a considerable portion of the bank in Dr. Trent's farm, where the river impinges on it, ought to be paved: and that the sum estimated for this object, in the last report, was too small, because it was only intended to pave the slope next to the river, whereas it is now thought necessary to pave both inside and out, as well as on the tow path, for reasons which did not present themselves at that time, and which it is thought proper now to communicate.

It was always an object of the utmost solicitude with the commissioner, as it must have been with all who have reflected with sufficient interest on the subject, that when the river navigation shall be abandoned, the canal shall be guarded with all possible care against the effect of freshes. It was this, which prompted him to draw the attention of General

Cocke to their effect on the New York Canal, as appears in the report of last year. His reply had great weight in lulling the fears of your commissioner on this important point. But, upon referring to a note at the bottom of his letter of 12th June, 1823, a most singular and important difference is discovered between the circumstances attending the Mohawk, and the James and Jackson's Rivers.

It appears by this note, that in going up from Schenectady, (the head of the falls on the Mohawk,) the fall of the river is as follows, viz: from Schenectady to Schoharie, 22 miles, fall 3 feet per mile average. Schoharie to Little Falls, 36 miles, fall 2 feet exclusive of the rapids. Little Falls to Utica, 22 miles distance, 1.6 inches per mile. Utica to Rome, 15 miles, fall 1 foot. The whole distance from Schenectady to Rome, being 95 miles. A few miles beyond Rome, the Mohawk takes its rise in a level country, and the waters beyond that, turn the other way to the lakes. So, that, in great and extensive rains, and melting snows upon that river, the water in the lower section, running more rapidly than that next above, is discharged before any accumulation can take place in like manner, each successive section is relieved from the torrent which descends in its neighborhood, before that which is coming from above can unite with it.

On James River, the circumstances are exactly reversed. In the first section from the old locks, (the head of the falls,) to Maiden's Adventure, 23 miles, the fall is one foot six inches per mile average, and for the next thirty-eight miles, to New Canton, 1 foot 11 inches per mile. After that, it gradually increases, till in the mountains it amounts in some sections, to an average of 12 feet per mile. The whole distance, from the old locks to Dunlop's Creek, being 245 miles. Beyond this, the sources of the river extend in many directions to a great distance in a mountainous country. Thus, in great and extensive rains and melting snows, while the water is moving with a comparatively slow pace, in the first section and for thirty-eight miles above, its velocity beyond that, increases more and more as we approach the mountains, whilst the dilatory motion below gives time for the increasing accumulation from above to overtake it, and to produce a torrent which inundates the valley from hill to hill, and sweeps every thing before it that is not firmly fixed, wherever the current prevails. This will enable us to account for the extraordinary fresh of 1771, which rose forty feet above common tide, and 1795 to twenty-eight feet: this last is marked upon the door of the ferry-keeper's house at Cartersville; that of 1771 is said by all who were old enough to notice it, to have been twelve feet higher than that of 1795. Those which have occurred since this, have varied from common high water mark to twenty-two feet above ordinary tide.

This remarkable difference in the character of the two streams cannot fail to shew, that no experience derived from the effect of freshes upon the Mohawk, can be of any value to us, in estimating their consequences upon James River, and must warn us of the danger to be apprehended to our canal; when the want of fall in the river from whence our supply of water must come. must of necessity leave it upon a comparatively low level for some number of miles below the feeder. How far it may be necessary to guard against this evil by pavement, will depend upon the opinion of the agent who may be employed to execute it. Your commissioner is under the belief, that it will at least be necessary where the river impinges on the banks in the farms of the Governor and Dr. Trent, which he supposes cannot cost less than twelve thousand dollars, which sum is included in the estimates for finishing this section.

The annexed tables will shew, that there was reported last year, to have been expended on the canal, between the old locks and the western mouth of Tuckahoe Creek,	$88,649 87
There has been expended on this section, in addition to what was reported last year,	40,800 70
There will be wanted to fence and gravel the towing path of this section, to finish the dam, and for valuation of land,	18,000 00
Making an aggregate sum for the cost of nine miles and fifty-six chains of canal, of	$147,450 57
Or, an average sum per mile, of	$15,200 00

Seven miles and 53 chains of this being the main line of the canal, and one mile 43 chains being the length of the feeder above the guard-lock, as reported last year.

There was reported, last year, to have been expended, between Wickham's bridge and Maiden's Adventure,	$48,543 41
There has been expended on this section, in addition to what was reported last year,	205,775 26
There will be wanting, to finish this section, to fence and gravel the towing path, and for damages of land,	85,000 00
Making an aggregate, for completing 15 miles and 36 1-2 chains of canal, of	$339,318 67
Or, an average sum, per mile, of	$21,306 40
The dam which fills the old canal at the lower arch, is so gone to decay, that it must be renewed next summer, since patching and mending will do no longer. It is difficult to estimate its cost with precision, because of its crooked direction and various height at different places; but, it is thought unsafe to put it at less than	$10,000 00

As it is important, that this section of the canal should be brought into operation as soon as possible, and the work at Beaverdam, and the dams across James River, cannot be attempted until the spring or summer, when the creek is not liable to frequent freshes, and the river shall fall to low water mark and become warm enough for the hands employed, to go into it; it is respectfully suggested to the Legislature, that it may be proper to instruct the James River Company, to reserve as much money as will serve for this purpose, in case there should be a prospect of deficiency in the appropriations for this and the mountain section.

It will be seen on reference to the amount expended on the section to Tuckahoe, that the sum reported last year, as necessary to finish it, independent of gravelling and fencing, for which no estimate was made, will not be materially deficient. On that, however, from Wickham's bridge to Maiden's Adventure, a much larger sum is required than was then deemed necessary. The estimates have generally proved adequate to those items of expenditure which were ascertained; but it has been found necessary to resort to many expedients which were not anticipated; and it was thought, that good economy required the execution of some of the work, in a more expensive style than was intended.

In addition to this, the estimates for damages to land were too low, in consequence of the assessments since the last report being higher than those made before, which furnished the standard for our subsequent estimates; and it will be necessary, to gravel at least as far as the highest coal mines, and to fence nearly the whole of the towing path; it being found that gates across the canal will not answer the purpose that was expected.

The commissioner, solicitous that the Legislature should be fully informed in relation to the expenditure of money upon the work done under his management; and that whatever errors he may have committed, should be discovered and made known, attended the engineers and commissioners who were required by the law of the last session to examine his work through the line of his operations; and afforded all the aid in his power in the investigation of the objects, to which their attention was directed. It rests with them to approve or condemn. For his own part, as regards the prices that have been paid, he considers it a duty he owes to the Legislature, as well as to himself, to express his belief, that the whole profit made by contractors since he has been in office, would not make an average of five per cent. upon the actual cost; that there is no instance of extravagant profits; and he is sorry to add, that a large proportion of those who have taken contracts under him, many of them hard-working economical men, have gone away from the work, as poor as they came to it.

In the alteration of contracts he did but exercise a sound discretion, which he conceived himself clothed with in some few cases, where the contractors could not accomplish their jobs at the contract prices, in consequence of unseen difficulties; rather than institute suits against them; make them pay their own money (if they had any) to the company, as the price of their miscalculations, and thereby excite alarm through the line, and intimidate others who might be disposed to make contracts.

If he has committed errors in overcoming the numerous difficulties which have presented themselves, he is consoled with the reflection, that the faculties of his mind and the energies of his body, have been diligently employed in endeavoring to guard against them.

It is proper to inform the Legislature, that, in contracting with Captain Thomas M. Randolph for the land through which the canal passes in his farm, the commissioner secured to the James River Company the use of his upper free-stone quarries, for the term of fifteen years, as will appear by the contract in the Second Auditor's office. This was done with a view to the construction of locks into tide water, whenever it shall be thought advisable. Those quarries are immediately on the canal.

It may be also a proper subject of inquiry, whether the expense of cutting the lateral canal up Tuckahoe Creek, as mentioned in the report of last year will be justified by the prospect of obtaining coal in its neighborhood? The mines have not been extensively used, though some persons are of opinion, that considerable bodies of coal exist there. The line located was five and a half miles in extent; and being on a level with the line to Pleasants's Island, and, consequently, requiring no locks, the expense was estimated by one of our sub-engineers, at between thirty and forty thousand dollars.

It now only remains for your commissioner to say, that, by the expiration of the term of his appointment, the section of canal which he has been engaged on, will be so near to its accomplishment, that the services of both himself and his engineer will not be required for this object. Those of an engineer cannot be dispensed with; but, if he were vested with the powers of a commissioner, it would be all that is necessary. He begs leave, therefore, to avail himself of this occasion to offer to your honorable body his grateful acknowledgments for the confidence you have reposed in him; and his earnest prayers for your health and happiness. He cannot, however, in justice to his own feelings, forbear to bestow upon the young gentleman, whom it has been his good fortune to select as his engineer, the tribute of his highest respect, for the talents, the zeal, the fidelity, and the unwearied assiduity, which he has manifested in the discharge of all the arduous duties which have been assigned to him. To his country, he owes it to say, that Mr. Robinson, in the humble judgment of your commissioner, is a young man of more than ordinary strength of mind, and maturity of judgment. He looks with earnest hope to the day, when his skill as an engineer will secure him the confidence of his native State.

With the most profound respect, Your obedient servant,

RANDOLPH HARRISON, *Comr. J. & J. R. C.*

December 8th, 1824.

No. 1.

A TABLE, shewing the amounts paid under the different contracts made for the completion of the James River Canal, from the upper arch to the western mouth of Tuckahoe Creek, from the 1*st of December*, 1823, *to the* 1*st of December*, 1824.

Names of Contractors.	*Contracts.*		
Adams, Kennedy & M'Vee,	Stone-walling, blasting, and embanking,	$2,697	00
Scrymger, Young & Bryson,	Building locks at upper arch,	2,395	00
Scrymger & Young,	Walling,	342	94
Robert & Charles Hyde,	Lock-gates and railing for walls,	588	37
Richard Reins, superintendent of labor, and purchaser of materials,	Expended in completing the contract of Lyons & Carter, repairing banks, and his own and overseer's wages,	6,000	00
Patrick Kelly,	Raising & shaping banks,	514	50
James Knox,	Excavation,	900	00
Lyons & Carter,	Lock and walling,	4,557	50
John Bosher,	Lock and dam at Fore's fish dam,	6,500	00
"	Blasting sluice in river,	900	00
Shields & Griffin, John P. & M. W. Shields, J. Enos & James Knox,	Excavation in Tuckahoe Creek,	3,930	00
Wilson Bryan,	Lock, guard, flood-gates and bridges,	1,829	00
Thomas B. Conway, and Conway & Staples,	Guard-lock at Wickham's bridge,	2,674	18
Liddall Bowles,	Fencing,	800	00
William Gill,	Building bridge,	200	00
John Hogarty,	Coping locks,	783	72
Robert L. Staples,	Fencing,	522	00
Wm. Shepherdson,	Cutting down timber on Tuckahoe,	[illegible]	00
	Amount carried forward,	$3[illegible]	

Names of Contractors.	*Contracts.*	
	Amount brought forward,	$36,309 91
John Dolton,	Balance on last year's work,	192 72
John Hitchcock,	Irons for lock-gates,	234 00
Philan & Cronan,	Excavation,	225 00
Stephen Duval,	Scantling for railing walls,	346 50
Timothy Callaghan,	Excavation,	50 00
Wm. Hetherton,	Forming banks on Tuckahoe,	700 00
Macon Green,	Rough masonry of lock,	228 19
Luther Barns,	Bolts for hand-railing,	106 59
David Norvell,	Excavation,	62 00
Levi Swain,	Lock-gates,	100 00
Adams & M'Vee,	Walling and puddling at old locks,	1,045 83
		39,600 70
Add amount paid John Wickham for damages,		1,200 00
		$40,800 70

No. 2.

Shewing the amount of money disbursed between the basin in Richmond, and the upper arch, since 1*st of December*, 1823.

Under the contract of John Staples, superintendent of labor and purchaser of materials; on the old canal; in work at the locks of Briggs & Gamble, and for his own services, and overseer's wages	$4,575 31
Paid John Gilmer for buttresses, walling and puddling at and above the locks of Briggs & Gamble,	869 50
Disbursed under the contract of Richard Reins,	1,550 00
	$6,994 81

No. 3.

A TABLE, shewing the amounts paid under the different contracts made for the completion of the James River Canal, from the Tuckahoe Creek guard-lock to the Maiden's Adventure Falls, from the 1st of December, 1823, *to the 1st of December,* 1824.

Names of Contractors.	*Contracts.*		
John Staples,	Dam at Maiden's Adventure,	$8,320	00
“	Walling and lock in dam at do.	5,379	00
John G. Crouch,	Excavation and embankment,	5,587	72
John M. Redford,	Excavation and embankment,	1,480	52
Lancelot Woodward,	Furnishing timber,	2,371	40
Scrymger & Young,	Walling and embankment,	4,150	00
John G. Gamble,	Building locks at Tuckahoe,	15,500	00
Patrick Kelly,	Embankment and blasting,	2,806	00
William Goode,	Excavation and embankment,	1,758	00
David Houston,	Walling and embankment,	4,588	50
James Stewart,	“ “	5,850	00
“	Excavation,	5,100	00
“	Bridge and culvert,	1,119	61
Stephen Philan,	Excavation and embankment,	3,021	51
Luther Barns,	Irons for lock-gates,	408	21
Joseph S. Watkins,	Excavation and embankment,	2,878	61
Adams & M'Vee,	Culvert at Stony Creek,	1,600	00
William B. Winston,	Excavation and embankment,	1,013	28
Richard Sampson,	Excavation and embankment,	1,379	33
Peter Roney,	Work on bridges,	401	00
	Amount carried forward,	$74,712	69

	Amount carried forward,	$74,712	69
John Gilmer,	Walling and embankment,	1,550	00
John P. Shields,	Excavation and embankment,	3,906	13
James Boyd,	Dover aqueduct,	700	00
Reins & Malone,	Excavation and embankment,	797	40
Charles Griffin,	Excavation and embankment,	4,295	13
"	Bridges, raising banks, &c.	250	00
Knox & Hale,	Excavation and embankment,	4,760	00
David Wallace,	Building bridge and culverts,	1,285	25
"	Genito aqueduct and culvert,	3,069	43
Pleasant Gordon,	Excavation and embankment,	569	84
Bowles & Burford,	Excavation and embankment,	610	60
"	Excavation and embankment,	6,420	80
Baker & Richards,	Completing Dover aqueduct,	2,850	00
"	Building four foot lock,	3,400	00
Mulholland & Fullerton,	Excavation and embankment,	1,238	50
Warner W. Minor,	Excavation and embankment,	3,500	00
William Griffith,	Excavation,	7,050	00
William Gilliatt,	Furnishing lime,	1,029	00
Dunn & Philan,	Excavation,	1,800	00
Ephraim Childs,	"	469	11
Jonathan Leslie,	"	2,211	68
James Burford,	Waste and bridges,	800	00
James Malone,	Embankment,	5,507	65
Joseph Morrison,	Waste and bridge,	290	00
Lawrence & Lidgerwood,	Aqueduct, embankments, &c.	17,000	00
Lidgerwood & Lawrence,	Guard-lock and bridge,	3,500	00
	Amount carried forward	$153,573	31

	Amount brought forward,	$153,573	31
Delany & O'Neil,	Ditching and excavation,	296	00
Lewis Webb & Co.	Furnishing lime,	1,125	00
John Hitchcock,	Irons of lock-gates,	234	00
Reuben Nash,	Fencing,	464	00
Daniel M'Fall,	Buttresses and work on bridges,	550	50
S. D. Crenshaw,	Furnishing lime,	2,401	45
William Gill,	Furnishing timber,	930	02
Robert P. Baker,	Culvert and bridge,	986	62
William Digges,	Walling,	380	00
Jasper Crouch,	Taking care of sick,	493	45
Robert & Charles Hyde,	Wastes, bridges and lock-gates,	950	00
Michael Lehy,	Excavation and embankment,	2,947	56
John Donnelly,	Wastes and railing,	654	00
George Coxon,	Excavation and embankment,	1,099	72
David I. Burr,	Castings,	3,576	00
Richard Walsh,	Excavation in Sampson's,	1,600	00
"	" at Maiden's Adventure,	8,931	00
Pleasant Gordon,	Excavation and embankment,	1,786	80
		$181,979	39
To these amounts, add salary of M. Robinson, engineer,		1,750	00
Do. do. Amount paid Hiram Tibbets, assistant,		705	66
Do. do. Amount paid William M'Kim, superintendent,		420	00
Do. do. This sum disbursed by the engineer for materials and labor, wages of leveller and staff-bearer, and expenses of himself and assistants,		6,105	56
Do. do. And this sum paid for damages of land,		14,814	65
		$205,775	26

REPORT

OF THE

COMMISSIONER

OF THE

KANAWHA ROAD AND NAVIGATION,

To the General Assembly of Virginia.

In obedience to an act, "making more effectual provision to carry into effect the act, entitled, 'an act to amend the act, entitled, 'an act for clearing and improving the navigation of James River, and for uniting the eastern and western waters by the James and Kanawha Rivers, and for other purposes;" the commissioner of the Kanawha Road and Navigation respectfully reports, that, finding that his duties on the Kanawha River and Road would be greatly increased this season, and that new and important duties were assigned to him on the James River, it became indispensable that he should call to his aid skilful, industrious engineers and superintendents. He, therefore, appointed Colonel William Paxton engineer and superintendent of the improvements on the Kanawha Road and River, and Major J. C. Warren, as an assistant. In consequence of the commencement of the season being wet, and generally a swell in the waters, it was late before the contractors could begin their operations on the Kanawha River. However, they have improved the navigation of the 79th, 78th, 77th, and 76th miles Tyler and Elk shoals, and the 21st, 20th, 19th, and 16th miles, agreeably to the survey of the river by Thomas Moore, the late engineer of Virginia, reported to the Board of Public Works in January, 1820. When this work was examined, the river was too flush to be considered at common low water; consequently, he has received it on condition (in writing) that next season when the water is low, if any defect or imperfection should appear in any part, it shall be made perfect. He is pleased with this work. The sluices are generally a good width, from fifty to sixty feet, and well graduated. He expects the contractors will commence next year with a considerable force; and, if the season is favorable, hopes the work will rapidly progress towards its completion. He has very little doubt in succeeding in making the navigation of this river good from its confluence with the Ohio River, to the termination of Loop Creek shoal. From this point to the Great Falls should be improved (if found to be practicable.) He has not been able to procure the aid of the principal engineer this season, to assist in examining this shoal; consequently, he has not acted under the authority vested in him by the 7th section of the act, entitled, "an act authorising a loan for the purposes of internal improvement," passed the 8th of last March. But, this examination can be as well done next summer as at any other time. Captain John Bosher, acting as superintendent of the old James River Company, prepared a number of boats, and machinery of different kinds, to enable him to progress with the work on the river; but a small part of this property is used by the present contractors; and the residue is of a perishable nature, and in danger of being carried off by freshets. After giving general notice, he has sold the greater part of it at public auction, on a credit of twelve months, with approved security, amounting to about $489; and when the remainder is sold, he will forward to the Second Auditor a statement of the property, and what it sold for. All the orders which he has given on the Second Auditor, for issuing warrants on the treasury, in favor of the contractors, for carrying on this work, are stated in the paper marked A.

KANAWHA ROAD.

A contract was made early in the season with James Moore, for extending the road from the Great Falls, along the margin of the river, to Montgomery's Ferry, a distance of 124 poles. And, notwithstanding the great difficulties which the contractor had to encounter, he has completed the work to the entire satisfaction of your commissioner. The road from the Great Falls to Lewisburg is completed, and received; and, in general, is an excellent road; a great part of it being conducted on dry, firm ground, that will not probably want paving with stone or gravel. Since its completion, it has been very considerably used by wagons, in transporting of salt from the salt works to Greenbrier; and will unquestionably be the main highway for future supplies of that article for the counties of Monroe, Alleghany, Pocahontas, and part of Nicholas. Experience has demonstrated, that such a road as was anticipated by the late engineer, cannot be made through the meadows of Meadow River and Otter Creek. These meadows lie almost on a plane with the horizon; and, in time of great rains, or at the breaking up of the winter, the water moves off very slow; and the tributary streams discharging themselves about the same time, the water rises like a small lake, and the road cannot be raised so high as to prevent the overflow of it in places. To obviate this difficulty, your commissioner had 86 poles of the road in the meadow of said river capped with stone. Since the waggoning commenced on this road, it is found that Otter Meadow, in the 15th mile, in time of wet weather, and at the breaking up of the winter frosts, will be impassable for carriages. He has, therefore, contracted for capping with stone the worst part of this meadow.

To bring this road so near a completion as it now is, through so rough and mountainous a country, and to make it of that public utility which it was expected to be, was a very difficult work, and required many things to be done which were not set forth in Caruthers' contract with the James River Company. Mr. Hugh P. Taylor's survey and report of the location of this road (which was made a part of said contract,) only required culverts to be made on the small branches. It was found necessary to make culverts to pass the water across the road in every hollow; and passways for the water across the road on hill-sides. On steep declivities where permanent embankments could not be made to support the lower side of the road, the greater part of the road, is cut out of the sides of the mountains. The plan of the bridges set forth in said contract, would not do for Howard's and Dunlap's Creeks; the intervals for the water between the piers not being wide enough to pass the large quantities of floating timber which is brought down by these powerful streams in time of freshets. Consequently, the bridges on Dunlap's Creek are built with intervals the width of the channel of the creek on the king post plan, and the residue of said bridges on the plan set forth in Caruthers' contract; and as it is important to preserve the king post part of these bridges, they are to have a cheap covering of 3-4 inch white pine plank. The bridges on Howard's Creek, are built on a cheaper plan with intervals between the piers of 40 feet for the floating timber to pass. Your commissioner has had a survey made of this road, by which it appears, from Covington to Lewisburg, is 29 miles and 96 poles; and from Lewisburg to the Great Falls of Kanawha, is 64 miles 142 poles. Which makes the road 2 1-4 miles longer than Mr. Taylor's survey of the original location; exclusive of any increase of distance which may have occurred in the several changes that were made in the location, in order to bring it to the grade of 5 degrees and other purposes. This increase of distance of 2 1-4 miles, and the additional work which was deemed necessary to complete the road, has increased the extra expense. For the first few years, until the road becomes settled and compact, and the obstructions of earth slips shall cease, it will require considerable attention and expense to keep it in good repair, but the tolls will be amply sufficient for the purpose. This is to be in a few years, the great travelling road to a considerable part of the western country, and will yield a considerable revenue over and above what will be necessary to keep it in repair. On the 20th day of September last, he put a toll-gate in operation at Metzkers, 50 miles west of Lewisburg. The collector informed him, that he had received upwards of $100 per month. A list of tolls to be collected at this gate till a general arrangement is made, is in the paper marked B. It will be unnecessary to incur the expense of many toll-gates on this road: but to lay on six gates the toll that the road shall be authorised to take; the first gate to be at Callaghan's on the 6th mile; the second, near the White Sulphur Spring on the 21st mile; the third, at the bridge on Greenbrier River; the fourth, at Crist's near where the old road leaves the turnpike on the 12th mile west of Lewisburg; the 5th, at Metzkers on the 51st mile; and the 6th, at the Gauley bridge on the 63d mile. From the trouble your commissioner has had with the toll-gate which he has put in operation, it appears necessary, that the Legislature pass a law regulating and arranging the rate of tolls, or that they would authorise either the Board of Public Works or the James River Company, to make the proper arrangements; and in doing this, perhaps there should be some discrimination between the neighborhood intercourse on the road, and the travelling interest. It is also necessary, that the law should authorise the prompt punishment of depredations committed on the road or the toll-gates. By reference to the map of the road which is forwarded with this report, and considered a part of the same, it will be seen, that the present road crosses Greenbrier River at W. in the land of Henry B. Hunter, where it is fordable the greater part of the summer and autumn. It would be a public advantage to discontinue the old road at this place where the bridge over the river is finished. Your commissioner has made a contract with Henry B. Hunter, by which it is stipulated, that his family, servants and customers to his mills and smith's shop shall pass the bridge toll free; and that he shall make to the James River Company a title in fee simple for one acre of land for a toll-house lot, and close and fence up the old road as soon as said bridge is completed, if the Legislature will authorise the discontinuing of said road. The bridge over Gauley River will soon be ready for travellers to pass over on it, and will be completed early next season. It is believed, that it will be the best bridge in Virginia. The contractor has commenced work on the Greenbrier bridge, and with the exception of these two bridges, all the bridges on the whole line of road are now completed, and also with the exception of a bridge at the ford of Howard's Creek, immediately below the White Sulphur Spring. It is expected, that the road from Covington to Lewisburg will be finished before the first of May next. All the orders which have been given on the Second Auditor for warrants on the treasury for carrying on this work on the road and bridges for the present year, are in paper marked C.

JAMES RIVER CANAL IN THE BLUE RIDGE.

The new duties assigned to your commissioner, by the 3d section of the act of Assembly, passed the 8th of March last, claimed his early attention. As preparatory, however, to their execution, the same act directed the engineer of the State to locate the contemplated canal. Your commissioner and the engineer met on the ground in April last, and proceeded forthwith to the performance of the work, which was completed about the first of the following month. Your commissioner immediately gave notice in the newspapers of the most general circulation, that he would receive proposals for undertaking the work until the 5th of June following, and on that day attend at Mr. H. Paxton's, near the mouth of the North River, for the purpose of making contracts: and in the mean time, the engineer had been requested to furnish your commissioner with an estimate of the quantity of work, in walling, embankments, excavation of earth, rock, &c. and of the probable expense of completing the canal; to enable him to act with all the lights which his judgment and experience could furnish, in making contracts with the undertakers; but, with this estimate he has not been furnished. He employed Thomas F. Purcell as engineer and superintendent of this work. A few days before the time which was appointed for making contracts, he received a communication from the engineer, with a copy of the following resolution of the Board of Public Works:

"*Resolved*, That the principal engineer, so soon as the commissioner of the Kanawha Road and Navigation shall have employed an engineer, to carry on the contemplated work between the Irish Falls and the mouth of the North Branch; or as soon thereafter as his other engagements will admit, be instructed to confer with the said engineer upon the ground, for the purpose of explaining the plan and design of the work in all its details, as lately laid out."

This communication gave general directions how to construct the canal and the locks, but there was no plan of the locks forwarded with it.

On the day which was appointed for making contracts, a very respectable number of persons attended; and, not having an estimate of the work to be done, your commissioner was obliged to contract by the perch and cubic yard, which perhaps was the safest way, both for the public and for the contractors, but very much increases the duties of the engineer and superintendent. All the proposals made to your commissioner for undertaking the aforesaid improvements, were for specified prices by the perch, cubic yard, and other details of the work, and none of them for doing the work for a gross sum. When the several proposals were compared with each other, it was found that some were a little higher in some articles of work, and lower in others; so that in the aggregate there was but little difference. Your commissioner, being strongly impressed with the belief, that despatch in this important work, for many considerations, is a great advantage, therefore, to accomplish this desirable object, he divided the canal into three sections, and let each section to men of whom he had the best evidence of their industry, enterprise, and qualifications to govern hands and carry on such a work. Accordingly, he received the proposals of John Jordan and John Irvine, and contracted with them to make the upper section of the canal, from the North River to near the Big Balcony Rock, and to erect a dam across James River, locks, &c. A copy of said contract, with an explanation of some points therein, is herewith forwarded, marked D. He received the proposals of John G. Gamble and Robert Gamble, and contracted with them to make the second section of the canal, which extends from the Great Balcony Rock to the crossing of the river above the Cushaw Falls. He received the proposals of Lyman and Sanford Brown, of Massachusetts, and contracted with them to make the canal on the south side of the river, from the upper end of the Cushaw Falls to the lower end of the Irish Falls. These contracts are the same in substance of the contract made with Jordan & Irvine, and are in the Second Auditor's office. The specifications of locks set forth in the aforesaid communication from Capt. Crozet, your commissioner was not able to explain to the satisfaction of gentlemen wishing to contract; in consequence of which, he directed his engineer to make out plans and specifications of the best kind of locks, reserving to himself in the contracts the power of changing the plan of the locks, or any part of the work which might be deemed necessary, when the aforesaid resolution of the Board of Public Works should be acted on, or at any other time in the progress of the work. The contracts being closed, and all necessary arrangements made, operations immediately commenced in the actual execution of the work. Jordan & Irvine were the first who began, and have prosecuted the work with an expedition which reflects honor on their names, as industrious and enterprising men. Messrs. Gambles and Browns, from the circumstance of their other engagements with the State being unfulfilled, were prevented from commencing work immediately; but, as soon as practicable they began, and have persevered assiduously in its execution. The number of hands now employed is 270: they are increasing daily, and a large reinforcement expected from Massachusetts. Where the canal will cross the river without a dam above the Cushaw Falls, a small rise in the river will make the stream too strong for boats to cross with safety; a bridge will therefore be necessary. And, as this will become the public travelling way from part of the upper country to Lynchburg, the toll on this bridge will be an object of some importance. As there appears no doubt but this canal, in the progress of time, will be continued down the river, and be connected with the lower canal; in that case locking down into the river at the lower end of the Irish Falls, would be the loss of upwards of $20,000; consequently, it would be much better to continue the canal about four miles farther, to near Waugh's Ferry, where of necessity it must lock down into the river, and this section of canal would not be expensive to make; but it is expected that the board of engineers and commissioners will report on these subjects. A statement of the orders given by your commissioner on the Second Auditor for warrants on the treasury to carry on this work is in the paper marked E.

It appears that the whole amount of orders which he has given on the Second Auditor for carrying on all the work under his direction the present year, exclusive of Cabin Creek shoal, [paper marked A.] is $106,787 43 1-2.

The extra work with the exception of the masonry on the bridges on Howard's Creek, is not in the above estimate.

The probable expense of making the James River Canal in the Blue Ridge, may be estimated at $250,000 00 including the said bridge, the dam and the locks; but this is only conjecture. This work, agreeably to the contracts, is to be completed on or before first day of December, 1826.

If the work is to progress on the large scale contemplated by the contractors, it will probably require for the ensuing year,	125,000 00
If the contractors for improving Kanawha River, progress next season with the force which it is expected they will employ, it will probably require	30,000 00
The contractor for making the Gauly and Greenbrier bridges,	18,000 00
The remainder of the $90,000, agreeably to Caruther's contract, is	10,000 00
To pay extra expenses for work done and not yet settled for, and for work yet to be done on the Kanawha Road, will probably amount to	3,200 00
	$186,200 00

This amount will probably be wanting to progress with all the work under my direction the ensuing year.

Your commissioner feels deeply impressed with the heavy responsibility arising from the extent and magnitude of the duties required of him, by the various laws respecting the improvements under his direction. His attention to a line of public work, (the extremities of which are near 250 miles apart,) has been zealous and unremitted. The deep interest which he feels for the success of an improvement, promising such immense benefits to his country, has unceasingly stimulated him to the exercise of all his energies, for its completion, in a style and manner commensurate with its importance, and that will do honor to its founders. All of which is respectfully submitted to the Legislature. Having had unexpectedly to attend the board of the engineers and commissioners on the James River Canal in the Blue Ridge, at the time which he intended to prepare this report, he hopes will be deemed a sufficient apology for its being forwarded at so late a date.

WILLIAM ANDERSON.
Commissioner Kanawha Road and Navigation.

December 8th, 1824.

[A.]

A Statement of all the orders which I have given on the Second Auditor, for issuing warrants on the Treasury, in favor of the contractors for improving the navigation of Kanawha River, pursuant to their contracts.

1824—May 22—Morrison and Epley, the advance which was to be made to them pursuant to their contract,	$4,000 00
Amount carried forward,	$4,000 00

		Amount brought forward,	$4,000 00
July	6,	David Smiley, the money which was to be advanced to him agreeably to his contract,	1,500 00
Sept.	29,	Col. Thompson, seven orders of $200 each,	1,400 00
Nov.	4,	Morrison and Epley, four orders of $892 50 cts. each,	3,570 00
	17,	David Smiley $595 & $1275,	1,870 00
			$12,340 00

David Smiley, for Cabin
Creek shoal.

There was an order given in favor of Smiley, for improving Cabin Creek shoal on the 21st mile, but the duplicate of it was left with Maj. H. Warren, the superintendent of the work on Kanawha, the amount of which I now do not recollect, but the order before this time is probably filed in the Second Auditor's office.

WILLIAM ANDERSON,
Commissioner K. R. & N.

December 1st, 1824.

[B.]

A list of the rate of tolls collected at the toll-gate at Metzkers, on the Kanawha Road, are as follows, to wit:

For a horse or mule, - - -	$0 12 1-2
For a man and horse, - - -	18 3-4
For every twenty head of hogs or sheep, -	31 1-4

For every twenty head of cattle, - -	62 1-2
And in the same proportion for a greater or less number of hogs, sheep or cattle,	
For every two wheeled carriage, with one horse,	37 1-2
For every ditto, with two horses,	50
For every four wheeled carriage, with one horse,	50
For every ditto, with two horses,	75
For every ditto, with four horses,	1 00
For every cart or wagon, on every animal it is drawn by, - - -	25
Wagons and carts returning, half the above toll.	
Those who live in the neighbourhood of the road, if they travel on it above 10 miles on horse-back, - -	12 1-2
The above is for a line of upwards of 64 miles of road.	

WILLIAM ANDERSON,
Commissioner K. R. & N.

December 3d, 1824.

[C.]

A Statement of all the orders which I have given on the Second Auditor, for issuing warrants on the Treasury, in favor of the contractors for carrying on the work on the Kanawha road, the present year.

1824—May 29,	John Caruthers and Alexander,	$7,324 66 2-3
	Ditto, for extra work	4,773 82
	Benjamin Hutsonpillar, for damages assessed to him for the Kanawha road passing through his land,	115 00
	Dennis Calaghan's deceased heirs, for ditto,	300 00
June	Col. Paxton, 1 quarter's pay,	250 00
	Amount carried forward	$12,763 48 2-3

	Amount brought forward	$12,763	48	2-3
July 6,	James Moore, the first payment of the road which he made, extending from the falls of Kanawha to Montgomery's ferry, 124 po.	434	16	2-3
Sept. 18,	Ditto, the balance due for making said road,	1,120	58	
	Col. Paxton, 1 quarter's pay,	250	00	
29,	Major J. C. Warren for ditto	250	00	
October,	John Caruthers, the remainder of the two-thirds of the $90,000, the amount of his contract with the Old James River Company,	8,523	32	2-3
	Ditto, for extra work on bridges, blasting rock, excess of distance in the road, &c.	8,140	36	
	James Burke, for smith's work done for the Dunlap's creek bridges, (the public to pay),	120	00	
	Charles Callaghan, for timber for ditto,	40	00	
	Elisha Knox, sen. for ditto for ditto,	30	00	
	Expenses for surveying the Kanawha road,	63	43	3-4
Nov. 5,	Wilkason, for masonry on the second bridge on Howard's creek,	178	93	
	John O'Neal and John Robinson for ditching in Otter meadow, to improve said road,	126	25	
		$32,290	52	3-4

WILLIAM ANDERSON,
Commissioner K. R. & N.

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A Statement of the orders given on the Second Auditor to issue warrants on the Treasury in favor of James Moore, the contractor, for making the Gauly and Greenbrier bridges, for the present year.

1824—May 22,	Per valuation,	$5,000 00
Sept. 7,	Per ditto,	3,000 00
18,	For improving the toll-house, lot, &c. at the Gauly bridge,	100 00
Nov. 19,	The advance which was to be made to him, agreeably to contract, on his commencing the Greenbrier bridge,	2,000 00
		10,100 00
	The amount of the expense of the road, brought forward,	32,290 52
		$42,390 52

If there should be any error in this statement, the Second Auditor can correct it, if all the orders have been presented to him.

WILLIAM ANDERSON,
Commissioner K. R. & N.

December 2d, 1824.

SUMMARY.

Road,	$32,290 52
Bridges,	10,100 00
Kanawha,	12,340 00
James River Canal,	52,056 91½
	$106,787 43½

[E.]

A Statement of all the orders which I have given on the Second Auditor, for issuing warrants on the Treasury in favor of the contractors for making the James River Canal in the Blue Ridge.

1824—August,	John G. Gamble and Robert Gamble,	$14,000 00
	Jordan & Irvine,	5,000 00
17,	Ditto,	9,000 00
30,	Lyman and Sanford Brown,	14,000 00
	T. F. Purcell, his pay for one quarter and boarding; and hiring and boarding an assistant to carry on the levelling line,	345 62½
Oct. 23,	Jordan and Irvine per valuation,	9,216 11
	Shields, for building a house for the engineer,	70 00
Dec. 2,	Thomas F. Purcell's account for one quarter's pay, boarding himself and leveller, and pay of leveller, and sundries,	425 18
		$52,056 91½

WILLIAM ANDERSON,
Commissioner K. R. & N.

REPORT

FROM

Committee of Roads and Internal Navigation, to the General Assembly of Virginia,

RELATIVE TO

JAMES AND KANAWHA RIVERS, &c.

THE committee of Roads and Internal Navigation, to whom was referred the Report of the Board of Public Works, respectfully beg leave to report upon that part in particular, which relates to the work now in progress upon the James and Kanawha rivers, and the road connecting those rivers.

This committee continue to regard that great and magnificent work, as one of the deepest interest to the welfare of this Commonwealth; and one which they hope the Legislature will never lose sight of until its completion. It is not yet five years since the charter of the James River Company was purchased by the State, and less than four since the work was commenced under any law which could be regarded as efficient for the attainment of the great objects of its enactment. During the whole of this period, it has had to contend against all the obstacles incident to all such undertakings. The inexperience of its friends and the want of confidence in a large portion of the good people of this Commonwealth, have greatly operated to retard its progress; but, notwithstanding such auspices, the work has steadily progressed, and presents at present the flattering prospect of thirty-four miles of canal, and one hundred miles of road in such a state of forwardness as to leave no doubt of their being finally completed, except a small section, the ensuing summer and autumn. At the western extremity of the line, upon the Great Kanawha River, much has already been done, and contracts have been made to the full extent of this great link in the connecting chain of improvement, (ninety-six miles in length,) by which the works upon that river are to be completed within two years.

Experience has taught us, that works of this character are much more expensive than was at first believed, and it now behooves us to pause and consider how far our means are adequate to the expenditure in which we have engaged. The sum of $830,000, has already been borrowed, and a further sum of $350,000 will probably be required to complete the works which have been commenced, making an aggregate of $1,180,000 of expenditure. The interest of this sum at the rate of six per cent. per annum, will amount to the sum of $70,800. To pay the interest of this debt, and finally to redeem it, our resources have hitherto been the surplus tolls of the James River Company, and a sum of $18,000 annually set apart from the fund for internal improvement for this purpose. Up to this time, those funds have been found sufficient, and a sinking fund now amounting to the sum of $40,300 has also been created. Your committee is aware, that the interest of the last loan of $400,000, and the new loan which they propose of $350,000, will create greater demands upon the fund for internal improvement, unless other resources should be found adequate to the payment of that interest. Your committee believe those resources will be had in the new revenues which will be derived from the tolls upon the different sections of the work now so nearly completed, and they offer the following estimate as shewing the probable income from the James and Kanawha rivers and the road, when those works shall go into complete operation, and a new tariff of tolls be established, in conformity with the different laws upon this subject, to wit:

Surplus tolls of the James River Company,	$7,000 00
Fund set apart for the payment of interest,	18,000 00
Interest to be derived from the Sinking Fund of $40,300,	2,418 00
Probable increase of toll on the lower section of the canal from the coal trade and new tariff,	20,000 00
Mountain section, probably,	6,000 00
Amount carried forward,	$53,418 00

Amount carried forward,	$53,418 00
Water rights,	2,000 00
Kanawha road,	10,000 00
Kanawha river,	8,000 00
Gauley and Greenbrier bridges,	3,000 00
Making an aggregate of	$76,418 00

Your committee believe, that this estimate will not be found to be materially wrong, and certainly not too large; but, on the contrary, they are induced to think, from the best lights before them, that some items of their statement might be increased. If, then, they have not made too large an estimate, the sum thus produced will not only be more than sufficient to pay the interest of the whole debt, but will produce a sum also of $5,618, to be applied annually to the increase of the Sinking Fund. When your committee reflect upon the magnitude of the debt, they would beg leave to recommend this fund to the particular and fostering care of the Legislature, and would suggest whether it would not be wise to make other provisions for its gradual augmentation. If such a course were pursued, it would ensure a certain extinguishment of the debt at a period sufficiently early, and would, at the same time, improve the credit of their stock in the market. The sum of five thousand dollars annually appropriated and invested in stocks, bearing an interest of six per cent. per annum, together with the operations of the existing fund of $40,300, would, in less than forty years, not only extinguish the existing debt, but also the new debt of $350,000 proposed to be created. Such an appropriation would not be burthensome to the State, while the result so desirable is as certain as numbers.

Your committee perceive, from the report of the Commissioner of the Kanawha Road and River, that nothing has been done towards the improvement of the road from Montgomery's Ferry to the termination of Loop Creek shoals, a distance of about four and a half miles; nor are they advised, whether he has been able to effect any change in his contract, so as to pretermit the improvement of so much of the river, and substituting the extension of the turnpike road for that distance. This change in the improvement, your committee regard as so desirable, that they would recommend further provisions, by law, to effect this object.

Your committee cannot close this report, without calling the attention of the Legislature to the growing importance of the salt trade upon the Kanawha River. At a very early period of this great undertaking, this subject engaged the attention of the Legislature; and whilst the magnitude of those manufactures, yielding, at this time, about one million of bushels of salt per annum, promised a large revenue to the Commonwealth, a reciprocal advantage was expected to accrue to them in the increased facilities of their carriage, to their great markets upon the Ohio River. Since the road has been opened, a new trade is carried on to the counties lying East of the county of Kanawha, and large quantities of salt are now transported across the mountains to those counties. The effect of this trade has been the expulsion of the foreign salt, heretofore carried from the sea board, and a reduction of the price, in some of those counties, to less than one half its former value. If further facilities were offered to the transportation, the benefits of the trade would be still more extended, and the tolls upon the road, already completed, considerably augmented. For this purpose, and also with a view to extend the road still further to the West, your committee would recommend the appropriation of a sufficient sum of money, to extend the present road to the lower end of the salt works in the county of Kanawha.

In closing this report, your committee would ask the attention of the Legislature to those great considerations which ought, in their opinion, further to induce its patronage to this splendid work—a work which, in its accomplishment, promises so rich and abundant a harvest of national prosperity and wealth. Next to the personal security and civil liberty of the citizen, it is the duty of government to augment, by every rational means, its population, wealth and strength; thereby contributing to the national prosperity and glory, and to the happiness of the people. In the condition of our own country, nothing, as your committee conceive can so effectually promote those great and desirable ends, as the opening of a free and easy intercourse with the variously diversified sections of the Commonwealth; thereby, extending its commerce, promoting its agriculture and manufactures, and bringing into useful employment all the natural resources of the country. The evidences to sustain this position, are every where around us, in proportion as the channels of inter[illegible]rse are improved; distance is shortened by the ease with which it is overcome, and people, alien and remote, are brought into near neighborhood and intercourse. This is most strikingly illustrated in the modern invention of the steam-boat; an invention, however grand in itself, which is best understood in the effect it has produced; an effect, however, unless it is met by a wise and liberal policy, which may do more to injure, than benefit our own country. We cannot, if we would, disguise it from ourselves, that Virginia, if not deteriorating, is certainly not advancing with the same rapidity as many of her sister states of this union: her population is passing to the West, contributing, by their wealth and industry, to raise up new, and as yet, unknown interests, in that important part of the United States. It is in this point of view, as your committee conceive, that this subject becomes most deeply interesting, and regarding this great chain of improvement as a social link, uniting the East and West, it deserves the highest consideration of Virginia.

Resolved, therefore, That the sum of three hundred and fifty thousand dollars be borrowed upon the credit of the state, to be applied to the extension of the canal through the Blue Ridge to a point near Waugh's Ferry, in conformity with the report of the Commissioner for the Kanawha Road and Navigation, to the finishing the works already commenced, upon the James and Jackson's Rivers and upon the Kanawha River and Road; and that the Commissioner of the Kanawha River and Road, be directed to discontinue for the present, the improvement of so much of the Kanawha River as lies between Charlestown and the falls of the Kanawha, and that the funds which would be applied to that purpose, shall be applied to continuing the road from the falls of Kanawha to Charlestown, on the said river.

Resolved, That it is expedient to increase the tariff of tolls on the lower section of the James and Jackson's River canal to such an amount, that an additional sum of twenty thousand dollars in tolls shall be received therefrom.

Resolved, That the sum of five thousand dollars be annually set apart and invested in the stock of the James River Company, to constitute, together with the stocks already held by that company, amounting to the sum of $40,300, a sinking fund for the ultimate redemption of the debt of the said company.

Resolved, That provision be made by law, authorising and directing the James River Company to pay over to the fund for Internal Improvement the sum of $10,000, the premium on the loan of $400,000, authorised by the act of the 8th of March, 1824.

Resolved, That the Commissioner for the Kanawha Road and Navigation be authorised to extend the canal, now constructing through the Blue Ridge, to a point near Waugh's Ferry, in conformity to his report upon that subject; a distance of about four miles.

Resolved, That provision be made, by law, for the renewal of lost certificates of the debt of the James River Company.

SECOND AUDITOR'S
STATEMENTS OF LOANS

OBTAINED TO EFFECT THE IMPROVEMENT OF THE

JAMES AND KANAWHA RIVERS,

AND OF THE

EXPENDITURE THEREOF;

Transmitted to the General Assembly,

1st January, 1825.

Summary Statement of Loans obtained to effect certain improvements in James River, in the Kanawha River, and to construct the Kanawha Road and Bridges, viz:

The act of Assembly of 17th February, 1820, authorized a loan for		200,000	00
The act of 28th February, 1821, authorized a further loan of		150,000	00
The act of 24th February, 1823, authorized a further sum of		80,000	00
Of this sum the former President and Directors of the James River Company borrowed at various times	161 600	430,000	00
And the President and Directors now in office, the sum of	268 400		
	430 000		
The act of Assembly of the 8th March, 1824, authorized a loan of $400,000, which was taken by the Farmer's Bank of Va. at a premium of 2 1-2 per ct. the certificates bearing an interest of 6 per ct. This loan was payable by instalments of $100 000; the first payment on closing the contract, and the remainder quarterly—3 instalments have been paid, with the premium thereon, amounting to		307,500	00
And the 4th will be received on the 19th January instant, or sooner if called for, say $102,500.			
Total receipts,		737,500	00
		737,500	00

The foregoing statements comprehend all transactions from the 17th February, 1820, to the present day.

Expenditures out of the several Loans obtained since the compact of the 17th February, 1820, with the former James River Company, viz:

Towards the improvement of the navigation of the James River, from tide water to Maiden's Adventure Falls,		515,999	18
Viz: By the former company,	99,094 24		
By the commissioner of the James & Jackson's River	416,904 94		
Towards rendering the Great Kanawha navigable from the Falls to the Ohio,		47,041	69
Viz: By the former company,	33,037 69		
By the commissioner of Kanawha Road & Navigation,	14,004 00		
Towards making the road from the mouth of Dunlap's Creek to the Great Falls of Kanawha, & bridges over Gauley & Greenbrier Rivers,		110,647	94
Viz: By the former company,	35,121 62		
By the commissioner of Kanawha Road and Navigation,	75,526 32		
Towards constructing the canal through the Blue Ridge from Irish Falls to mouth of North River,		52,056	91
For salaries of the commissioner of the Kanawha Road and Navigation, and his engineers on the Kanawha Road River, and contingent expenses,		4,333	29
For salaries of 2d Auditor and clerk,		1,143	83
Total expenditures,		731,222	84
Balance of cash now in the treasury,		6,277	16
		737,500	00

2d Auditor's Office, 1st January, 1825. *E. E.*

J. BROWN, Jr.

STATE OF THE REVENUE

Of the James River Company for the year 1824, transmitted to the General Assembly, 5th January, 1825.

RECEIPTS.

Tolls on produce and merchandize,	$31,542 74	
Rents of water, due prior to the 1st January, 1824,	*468 75	
Due the 1st January, 1824,	3,140 00	
Rents of ground, due prior to 1st January, 1824,	*501 38	
Due the 1st January, 1824,	350 00	
Total amount of gross receipts,		$36,002 87
Deduct expenses, viz:		
Salary of toll-gatherer,	$2,000 00	
Salary of upper lock-gate keeper,	656 77	
Salary of lower lock-gate keeper,	200 00	
Salary of door-keeper of the board,	40 00	
Blank book $10 50; permits, $12; coal, $32 05; for toll-gatherer's office,	54 55	
Blank certificates of loan, transfers and warrants; for Second Auditor's office,	47 75	
Advertising in March last in National Gazette for proposals for $400,000 loan,	10 50	
Repairs to upper lock-keeper's house,	24 33	
Stationery and books for upper lock-keeper's office,	8 56	
Expenses of the year,		3,042 46
Nett revenue,		*32,960 41
Add balance in the treasury the 1st January, 1824,		2,460 82
		$35,421 23

EXPENDITURES.

For dividends, as follows:			
Due previous to 2d May, 1823,		$288 00	
Due July, 1823,		336 00	
January, 1824,		8,184 00	
July, 1824,		8,148 00	
Whole amount of dividends paid within the year,			16,956 00
There remains a balance in the treasury on the 31st day of December, 1824, of			18,465 23
Which is applicable as follows, viz:			
1st. *To pay the following unclaimed dividends, viz:*			
Due previous to 2d May, 1823,	$2,330 12		
Due July, 1823,	216 00		
January, 1824,	216 00		
July, 1824,	252 00		
And the dividend due January, 1825,		8,400 00	
Amount reserved to pay all dividends to 1st Jan. 1825, inclusive		$11,414 12	
2d. *The remainder* towards the payment of the interest due 1st, and payable the 15th January, 1825,		7,051 11	
		$18,465 23	
			$35,421 23

* To shew the precise nett revenue received in the year ending the 31st December 1824, rejecting sums due previously, but collected in that year, deduct from $32,960 41

Rents of water due prior to 1st January, 1824,	$468 75	
Rents of ground, do. do.	501 38	
		970 13
Nett of actual revenue, 1824,		$31 990 28

E. E.

J. BROWN, Jr.

Second Auditor's Office, 1st January, 1825.

SUMMARY STATEMENT

Of the Surplus and Appropriation Fund set apart for the payment of the interest and redemption of the principal of the debt of the James River Company, from the creation of the said Fund, to the 31st day of December 1824; transmitted by the Second Auditor to the General Assembly, 5th January 1825.

Sums passed to the credit of the aforesaid Fund on the books of the Fund for Internal Improvement, viz:

Surplus of the tolls and rents of the James River Company for the year 1820, paid into the treasury the 5th July, 1821,		$5,370 59
Appropriations made by law payable annually out of the income of the fund for internal improvement, viz:		
Set apart by the Board of Public Works, in February, 1822,	$18,000 00	
Do. do. in January, 1823,	18,000 00	
Do. do. in January, 1824,	18,000 00	
Do. And in December, 1824,	1,997 95	
		55,997 95
Dividends and interest on so much of the said receipts as has been and now is invested, viz:		
For dividends for July, 1822, and January, 1823, on 210 shares of United States' bank stock,	$997 50	
For interest on $40,300, certificates of James River loans (purchased in December, 1822, and February & March, 1823,) to the 1st of July last, inclusive,	3,258 09	
		4,255 59
Amount carried forward,		$65,624 13

Amount brought forward,	$65,624 13
Deduct as follows:	
By an act passed the 2d March, 1822, the Board of Public Works were authorised to pass to the credit of the surplus fund, in satisfaction of the sum of $23,370 59, then due the said fund by the board, 210 shares of United States' bank stock, which, on a re-sale for the purpose of investment in the James River loans in January, 1823, produced a loss of	1,677 45
Total nett amount at credit of the surplus fund, from its creation to this day,	$63,946 68

The above stated sum of $63,946 68, *has been appropriated as follows, viz:*

For the payment of interest due 1st January, 1824, on James River Company certificates, amounting to $364,600,	$10,256 92	
To ditto ditto due 1st July, 1824, on certificates for $530,000,	13,389 76	
Total amount paid for interest,		23,646 68
For James River certificates of loan purchased in December, 1822, and February and March, 1823, and now in the possession of the Board of Public Works,		40,300 00
		$63,946 68

E. E.

J. BROWN, Jr.

Second Auditor's office, 1st January, 1825.

LIST OF CANAL, TURN
December, 1824, exhibi

COMPANIES

Cartersville Bridge, - -
Dismal Swamp Canal, -
Fairfax Turnpike, - -
Fauquier and Alexandria Turnpike,
Fallsbridge Turnpike, -
Leesburg Turnpike, - -
Lynchburg and Salem Turnpike,
Manchester and Petersburg Turnpik
Monongalia Navigation, -
Richmond Dock, - -
Roanoke Navigation, -
Snicker's Gap Turnpike, -
Swift Run Gap Turnpike, -
Wellsburg and Washington Turnpik

LOANS.

Dismal Swamp Canal, -
Ditto 500 shares United
Ditto - -
Richmond Dock, 375 shares Virgini
Ditto, - -

subscriptions or loans, from its creation to the **31** *st*
to complete the said subscriptions and loans.

ARY, 1825.

Amount actually paid on each subscription.	*Years in which the remaining instalments are payable.*			*Amount remaining to be paid on each subscription.*
	1825.	1826.	1827.	
5000 00				
46500 00				
900 00	1800 00	1800 00	900 00	4500 00
7500 00	15000 00	7500 00	-	22500 00
16000 00	8000 00	-	-	8000 00
33600 00				
5000 00	10000 00	10000 00	5000 00	25000 00
-	4000 00	4000 00	-	8000 00
7900 00	6100 00	-	-	6100 00
62500 00				
70400 00	6400 00	3200 00	-	9600 00
15000 00	5000 00	-	-	5000 00
46000 00				
5000 00				
50000 00				
50000 00				
-	15000 00	15000 00	7500 00	37500 00
37500 00				
12500 00				
471300 00 B.	71300 00	41500 00	13400 00	126200 00 C.

Amount paid on account of subscriptions to stocks and loans to the 31st December, 1824, as per column B.	$471,300 00
Amount remaining to be paid on the same account, as per column C.	126,200 00
Amount subscribed as per column A.	$597,500 00

Note 1.—In the late annual report of the Board of Public Works, provision is made for a subscription of 6,900 dollars to the Slate River Company. That subscription, however, has not been called for by the stockholders of that company, and, therefore, is not included in this statement.

Note 2.—The total amount of the disposable fund of the Board of Public Works on the 31st December, 1824, was as follows, viz:

Paid on account of subscriptions, &c. as above stated,		$471,300 00
35 shares Farmers' Bank of Virginia,	$3,500 00	
50 shares Bank of the Valley,	5,000 00	
34 shares James River Company,	6,800 00	
		15,300 00
Amount as stated in the 9th annual report of Board of Public Works, to 1st Dec. 1824,		$486,300 00

E. E.

J. BROWN, Jr.

Second Auditor's Office, 7th January, 1825.

TENTH

Annual Report

OF THE

PRESIDENT AND DIRECTORS

OF THE

BOARD OF PUBLIC WORKS,

TO THE

GENERAL ASSEMBLY OF VIRGINIA,

SEVENTEENTH JANUARY, 1826.

RICHMOND:

SHEPHERD & POLLARD, *Printers.*

....

1826.

RICHMOND, 18th January, 1826.

SIR,

I have the honor to lay before the General Assembly, the Annual Report of the President and Directors of the Board of Public Works, prepared in conformity to the act, entitled, "An act creating a Fund for Internal Improvement."

With great respect, I am, sir,

Your most obedient servant,

JOHN TYLER,
President.

The honorable the Speaker of the House of Delegates.

REPORT.

The President and Directors of the Board of Public Works, in obedience to the act, entitled, "An act to create a Fund for Internal Improvement," beg leave to report to the General Assembly, that the Fund for Internal Improvement consisted, on the 1st day of December, 1825, of the following stocks, viz:

PERMANENT FUNDS.

125½	shares of stock in the Little River turnpike company,	12,550 00
250	shares of stock in the James River company,	50,000 00
7947	shares of stock in the Bank of Virginia,	794,700 00
3334	shares of stock in the Farmers' Bank of Virginia,	333,400 00
900	shares of stock in the Bank of the Valley,	90,000 00
231	shares of stock in the North Western Bank of Virginia,	23,100 00
82	shares of stock in the Swift-Run-Gap turnpike company,	4,100 00
Certificates of James River Company,		50,000 00
70	shares in the Dismal Swamp Canal company,	17,500 00
125	shares in the Appomattox company,	12,500 00
70	shares in the Potowmac company,	31,111 11
	Total amount of permanent funds,	$1,418,961 11

DISPOSABLE FUNDS.

Stocks acquired by the application of the income of the fund for Internal Improvement, and disposable according to the 13th section of the act creating that fund, viz:

375	shares in the Bank of Virginia, lent to Richmond Dock company,	37,500 00
35	shares in the Farmers' Bank of Virginia,	3,500 00
50	shares in the Bank of the Valley,	5,000 00
34	shares in the James River company,	6,800 00
500	shares in the United States Bank, lent to Dismal Swamp Canal company,	50,000 00
672	shares in the Leesburg turnpike company,	33,600 00
920	shares in the Swift-Run-Gap turnpike company,	46,000 00
50	shares in the Cartersville Bridge company,	5,000 00
480	shares in the Fallsbridge turnpike company,	24,000 00
200	shares in the Wellsburg and Washington turnpike company,	5,000 00
400	shares in the Snicker's Gap turnpike company,	20,000 00
186	shares in the Dismal Swamp Canal company,	46,500 00
1000	shares in the Richmond Dock company,	62,500 00
800	shares in the Roanoke Navigation company,	73,600 00
160	shares in the Fairfax turnpike company,	2,700 00
300	shares in the Lynchburg and Salem turnpike company,	15,000 00
300	shares in the Fauquier and Alexandria turnpike company,	22,500 00
80	shares in the Manchester and Petersburg turnpike company,	4,000 00
140	shares in the Monongalia navigation company,	8,180 00
Loan to the Richmond Dock company,		12,500 00
Loan to the Dismal Swamp canal company,		50,000 00
	Total amount of disposable funds,	$533,880 00

James River Certificates of Loan, purchased with the unemployed money set apart out of the fund for Internal Improvement, for the payment of the interest on certificates of James river company loans,	$40,300 00

Total amount of the fund in stocks, loans and cash, viz:	
Permanent funds in stocks,	1,418,961 11
Disposable funds in stocks,	533,880 00
Surplus and appropriation fund in James river certificates,	40,300 00
To which sum, add balance at the credit of the fund on the books of the treasury,	10,090 62
	$2,003,231 73

Upon the productive part of the permanent and disposable funds, there have been received since the first day of December, 1824, for dividends and interest, the following sums, viz:

From the Bank of Virginia, on 7947 shares,		47,682 00
" Ditto,	375 "	1,827 50
" Farmers' Bank of Virginia, on 3369 shares,		17,687 25
" Bank of the Valley, including July, 1824, on 950 shares,		8,475 00
" North Western Bank of Virginia, on 231 shares,		1,501 50
" James River company, on 284 shares,		6,816 00
" Little River turnpike company, on 125½ shares,		627 50
" Swift-Run-Gap turnpike company, on 82 shares,		82 00
For interest on James river loans, $50,000 00		3,000 00
interest on loan to Richmond dock company, $12,500 00		750 00
From Petersburg for expense of surveys,		391 65
On account of the James river company surplus and appropriation fund, viz:		
From the James river company for surplus of tolls and rents, after paying expenses and dividends, in July, 1825,		7,051 11
Amount carried forward,		$95,891.51

Amount brought forward,	$95,891	51
From the same in July, 1825,	7,335	93
From the same for premium on the loan of $400,000,	10,000	00
For interest on $40,300 of James river company loans,	2,291	50
Total receipts,	$115,518	94

Out of which there have been disbursed during the year ending the 30th November, 1825, the following sums, viz:

First instalment to the Manchester and Petersburg turnpike company,	4,000	00
Fourth instalment to the Snicker's Gap turnpike company, (in full,)	5,000	00
Second and third instalment to the Fairfax turnpike company,	1,800	00
Second and third instalment to the Lynchburg and Salem turnpike company,	10,000	00
Second and third instalment to the Fauquier and Alexandria turnpike company,	15,000	00
Third instalment to the Fallsbridge turnpike company, (in full,)	8,000	00
Eleventh instalment to the Roanoke Navigation company,	3,200	00
Third instalment (in part) to the Monongalia Navigation company,	280	00
For expense of surveys and examinations prior to the 1st December, 1824, but paid since,	2,731	62
For expense of surveys within the last year,	2,223	02
For one year's salary to the collector ending 23d June last,	500	00
For salary to 2d Auditor one third of a year ending 1st October last,	500	00
For salary to 2d Auditor's Clerk for same time,	233	34
For compensation and mileage of the Directors, at two meetings (in December and January last,)	1,918	23
For printing 150 copies of the 9th annual report,	187	31
Books and stationery for the use of the fund,	18	50
Ledger and Journal for the use of the fund in Treasury Office,	20	00
Amount carried forward,	$55,612	02

Amount brought forward,	$55,612	20
Compensation to door-keeper, and postages,	87	90
Interest on Certificates of James river company loans, due July, 1824,	9	99
Interest on $ 730,000, due in January, 1825,	19,781	95
Interest on $ 930,000, due in July, 1825,	25,766	25
The Map of Virginia, paid Herman Boye, in full,	4,428	79
For one year's salary to the Engineer, ending 1st October last,	3,500	00
Total disbursements,	$ 109,186	90

The certain and probable charges upon the income of the fund for the current year, will be,

The last instalment to the Fauquier and Alexandria turnpike company,	7,500	00
The fourth and fifth to the Fairfax turnpike company,	1,800	00
The fourth and fifth to the Lynchburg and Salem turnpike company,	10,000	00
The second and last to the Manchester and Petersburg turnpike company,	4,000	00
The fifth and last to the Roanoke Navigation company,	6,400	00
The first and second to the Slate river company,	3,450	00
The first and second of loan to the Dismal Swamp canal company,	15,000	00
Expenses of surveys and examinations, estimated at	3,000	00
Salaries of principal Engineer, Collector, 2d Auditor and clerk,	4,533	33
Compensation and mileage of the directors,	1,058	53
Expense of printing annual report, postages, books, door-keeper, &c.	350	00
Interest on certificates of loans of the James River company,	59,673	50
Total probable disbursements,	$116,765	36

To meet which, the resources of the fund will be,

The balance in the treasury on the 1st December, 1825,	10,090	62
Amount carried forward,	10,090	62

Amount brought forward,	10,090	62
And this sum unexpended of advances made for surveys in the past year, and since accounted for by the principal engineer,	448	31
Dividends on stock of the Bank of Virginia,	47,682	00
Dividends on stock of the Farmers' Bank of Virginia,	18,529	50
Dividends on stock of the Bank of the Valley,	5,650	00
Dividends on stock of the North Western Bank of Virginia,	1,501	50
Dividends on stock of the James River company,	6,816	00
Dividends on stock of the Little river turnpike company,	627	50
Dividends on stock of the Swift-Run-Gap turnpike company,	82	00
Dividends on Loan of stock to the Dismal Swamp canal company,	2,750	00
Dividends on Loan of stock to the Richmond Dock company,	1,827	50
Interest on loan of money to do.	750	00
Interest on loan of money to the Dismal Swamp canal company,	3,000	00
Interest on certificates of James River company loan,	3,000	00
Interest on do. belonging to surplus fund,	2,291	50
Interest previously due from the Dismal Swamp canal company,	10,875	00
Premium on the loan of $200,000, to be applied towards the payment of interest on James River company certificates of loans, if the Legislature so direct,	1,000	00
	116,921	43
To which may be added, the surplus of tolls from the James River company, in the 12 months, ending on the 30th June 1826, estimated at	12,000	00
Total probable receipts within the year,	128,921	43
Total certain and probable disbursements within the same time,	116,765	36
Probable surplus after meeting the engagements of the Board within the year,	$12,156	07

The state of the fund as herein exhibited to the view of the General Assembly, presents an improvement which cannot fail to be satisfactory to the friends to a system of internal improvement. The permanent fund under the act creating it, does not admit of an augmentation by any means in the power of the Board to adopt. The disposable fund has however been increased by the sum of $47,280; and the balance in the treasury on the 30th November last, exceeded that reported on the 30th November preceding, by the sum of $5,883 73, giving an increase of $53,163 73. The capital at this time, consisting of permanent and disposable funds, is $2,003,231 73. The increase of capital, consists of stocks acquired by appropriations to companies incorporated by the General Assembly; and, although it gives the assurance that at a future day the fund may be more generally useful in promoting the object for which it was created, does not afford the means of giving aid or assistance to any new works of improvement within the present year, as the charges upon the fund are of a more certain character, and can be more correctly ascertained than the receipts, which, from the sources whence derived, must be in a great degree conjectural, and the latter exceed the former by so small an amount, as not to warrant an engagement on the part of the Board, to be complied with within the period named. During the present year, payments in full on account of subscriptions to the Fauquier and Alexandria turnpike company, the Manchester and Petersburg turnpike company, and Roanoke Navigation company; and in the next, to the Fairfax turnpike company, the Lynchburg and Salem turnpike company, and the Slate river turnpike company, amounting to $27,250, will have been made, and the income of the fund being relieved by that amount, the patronage of the Commonwealth through the Board, may be extended to other and new works of improvement in sections of the State which have hitherto received little or no benefit from the fund. This expectation was expressed and indulged in by the Board, in their last annual communication, in which, however, they were disappointed by the burthen thrown upon the income of the fund in being made chargeable with the payment of interest on the loans created for the improvement of the James river. The amount paid on this account last year, was $45,558 19, from which may be deducted, the surplus tolls of $14,387 04, and premium of 10,000 received on the loan of $400,000, amounting to $24,387 04, which will give the actual amount of interest paid. The interest payable on these loans this year, is

$59,673 50, which cannot be expected to be reduced by surplus tolls, and premium on the last loan of $200,000, (if it shall be added to the fund,) more than $13,000, which will leave chargeable upon the income, and to be paid on account of that improvement prior to the 30th November next, the sum of $46,673 50. This view of the revenue of the fund, shews that the payments on account of interest on the James River company loans, is nearly equal to one half of the annual receipts. An increase of tolls under the new tariff which has recently gone into operation, may however be calculated upon, and a further improvement in the receipts of the company arising from an increase of products, which may seek a market by this navigation, may be expected to take place. If these expectations are realized, and all must concur in the hope that they may be, the disposable fund will be relieved in an exact ratio with the improvement in the revenue of the company.

A comparison of the receipts of the last year with those of the preceding year, exhibits an increase of revenue, and a saving of nearly two thirds of the cost of surveys, &c. of the previous year, was effected in the last: the expense that will be incurred during the present year will be inconsiderable, and it is satisfactory to the Board to have it in their power to say, that at the same time their revenue has increased, their expenses have diminished. But few of the stocks of the canal and turnpike companies acquired by the application of the income of the fund, under the acts of the General Assembly and resolutions of the Board, as yet pay any dividends, and the revenue derived from this source is at present very inconsiderable. The appropriations made to companies with which the Board has thus become connected, though unproductive of revenue, have not failed in producing a good effect. A spirit of improvement, it is believed, has been excited in some sections of our State where none existed before; and the assistance afforded in several instances, has led to the undertaking of improvements which otherwise would not have been commenced, and could not have been accomplished. The Board, however, entertains the expectation, that in addition to the benefit thus conferred, a revenue will in time be derived, which will enable it to extend the sphere of its utility. On the last loan of 200,000 dollars for the improvement of James River, a premium of 1000 dollars was obtained, which it is respectfully suggested may, by an act of the General Assembly, be directed to be paid to the fund for internal improvement, as the fund is charged with the payment of interest on this last, as well as the previous loans authorised for the same object. The premium on the previous loan of 400,000 dollars, was, by an act of the last General Assembly, directed to be applied in this way. The estimate of disbursements for the year does not embrace an appropriation to the Monongalia Navigation Company. The condition of that company cannot be satisfactorily ascertained from the representations made by either of the two parties into which it would appear to be divided, so contradictory are they; enough is known, however, to induce the Board to believe that the payments heretofore made, will be nearly, if not entirely lost to the fund. Under this impression, and from a well founded belief, that the work will not be farther prosecuted, no appropriation has been made, and no payment on account of the subscription to that company will be authorised. This subject has not failed to engage the attention of the Board; but as it is known to be before the Legislature, all the papers in their possession, submitted at their present session by the company or members thereof, with a report of a committee of this Board, have been directed to be communicated to the chairman of the committee of Roads and Internal Navigation, as in the opinion of the Board, until the expiration of the charter of the company, nothing can be done without some Legislative provision on the subject.

The reports of the Principal Engineer on the surveys executed within the last season of operations in the field, received by the Board, are herewith communicated. They are a summary report of his operations during the year, and a report on the improvement of the west fork of the Monongalia river. Reports accompanied by charts on all the surveys enumerated in his summary communication will be submitted to the Board, or to the members ex-officio. They are numerous, and afford satisfactory evidence of his diligence and close attention to the duties required of him. After his return to this place from his field operations, with a view to prepare his reports and charts, he experienced a severe attack of the pleurisy, which, for the time it continued, and for some time after, in consequence of the very debilitated state in which it left him, rendered him incapable of doing so in time to accompany this report. They will be communicated by the president of the board.

Reports and returns from the several companies, in the stock of which the Board is interested, accompany this communication. They are as herein mentioned, viz:

The Upper Appomattox Company;
Cartersville Bridge Company;
Dismal Swamp Canal Company;
Fairfax Turnpike Company;
Fauquier and Alexandria Turnpike Company;
Fallsbridge Turnpike Company;
Leesburg Turnpike Company;
Little River Turnpike Company;
Lynchburg and Salem Turnpike Company;
Manchester and Petersburg Turnpike Company;
Potowmac Company;
Richmond Dock Company;
Roanoke Navigation Company;
Snicker's Gap Turnpike Company;
Swift-Run-Gap Turnpike Company;
Wellsburg and Washington Turnpike Company; and
Return of the Monongalia Navigation Company:

All which is respectfully submitted.

JOHN TYLER, *President.*

Richmond, 17*th January,* 1826.

RETURNS AND REPORTS

OF

ROAD AND NAVIGATION COMPANIES.

UPPER APPOMATTOX COMPANY.

NOVEMBER 1, 1825.

*To the **President** and Directors of the Board of Public Works.*

GENTLEMEN,

Enclosed you have our return for the year 1825. The enclosed papers shew the amount of tolls and rents, and the present state of the company's funds. The only debt we now owe of any importance, is to the Commonwealth for money borrowed. We propose to apply our income the ensuing year, to the discharge of that.

Could we be considered at liberty in this place, to make a few remarks as to our system of Internal Improvement, and the distribution of the funds for some years past, we would observe, that the rules adopted for the government and distribution when first set apart, were excellent. If strictly adhered to, we must and will succeed, because they are wise, because they are just. To call on each section of the State for their three-fifths, who apply for their proportion of the public funds, enlarges capital, ensures fidelity and economy, and guards against the injustice, the impatience and machinations of party.

If the government would take more than two-fifths, and the rule were general, the justice and policy of the law would still be preserved. That this equitable mode of distribution should have been lost sight of, is much to be regretted. It has already given rise to much local jealousy, and must ultimately tend to defeat a system most eminently calculated to improve and exalt our State.

We hope, however, that a liberal and impartial policy may yet redeem the errors that have been committed, and produce the beneficial effect anticipated in the establishment of the fund.

With great personal regard, and wishes for the success of your joint labours,

We are, gentlemen,

Your obedient servants,

JAMES MADISON,
NATHL. E. VENABLE,
RICHARD N. VENABLE,
THO. A. MORTON,
Superintendents.

Account of tolls received by the Upper Appomattox company, during the year ending 31*st of August*, 1825.

9,169	barrels of flour,	producing in tolls, $3,497 18.
17,424	bushels of wheat,	
4,259	hogsheads of tobacco,	
630	bushels of corn,	
6,764	bushels of salt,	
663,525	lbs. goods,	
339	tierces of lime,	
24,500	staves,	
6	loads of wood,	
140	bushels of coal,	

The canal broke on the 21st January, and was not repaired so as to admit boats until the 14th March, and consequently no tolls were received during the intervening time.

Return of the state of the Upper Appomattox Company, on the 1*st day of September*, 1825.

Capital subscribed,	61,100 00
Aggregate of requisitions made on stockholders,	61,100 00
Amount carried forward,	$122,200 00

Brought forward,		$122,200 00
Amount paid by stockholders,		61,100 00
Amount due by Board of Public Works,		00 00
Amount due by individual stockholders,		00 00
Capital expended in the work,		86,789 61
Tolls received from 1st September, 1824, to 1st September, 1825,		3,497 18
Lease of water for same period,		2,000 00
Sum expended in improvements and repairs,		1,626 35
Officers' salaries and expenses of collecting tolls,		600 00
All other expenses,		259 08
Dividends declared,		00 00
Balance of money on hand,		1,034 98
Debts due by the company,	5,753 44	
Interest on said debts,	4,870 91	
		10,624 35
Debts due to the company,	16,514 68	
Interest on said debts,	1,018 11	
		17,532 79

S. D. MORTON.

CARTERSVILLE BRIDGE COMPANY.

Powhatan, December 4th, 1825.

Sir,

A meeting of the Cartersville Bridge Company was called on the 1st instant, for the purpose of making their annual report to the Board of Public Works, but owing to the inclemency of the weather, a board was not formed. Under these circumstances, I think it best, forthwith to enclose to you the account of our Treasurer, (which is supported by vouchers,) and which will exhibit the true condition of the affairs of the Company, and which you may deem the annual report of the same.

TH. MILLER, *President*
Of Cartersville Bridge Company.

James Brown, Jr. *2d Auditor.*

The Treasurer of the Cartersville bridge company reports:

That he has received of the funds of the company, since 1st November, 1824, as will appear by his account with toll-keepers,		567 19
He has expended for the company,	524 47	
And received of the company the balance due him on a settlement, dated 26th Nov'r. 1824,	6 94½	
Making		531 41½
Which deducted from the receipts, leaves due the company,		35 77½
The amount of the company's debts is,		950 00
The debt due the company, is as follows, viz:		
Balance due on subscription of 1823,	50 00	
Ditto ditto 1824,	108 50	
Ditto, falling due 1st January, 1826,	258 00	
Making,	518 50	
To which add the cash on hand,	35 77½	
Leaves an amount of,	554 27½	
Which, if deducted from the amount of the company's debts, say,	950 00	
Shews a balance of,		395 72½
To be paid out of the income of 1826.		

Respectfully,

F. B. DEANE, Jr. *Treasurer.*

DISMAL SWAMP CANAL COMPANY.

NORFOLK, December 5th, 1825.

JAMES BROWN, JR. 2d *Auditor*.

SIR,

The return of the Dismal Swamp Canal Company, for the year terminating on the 30th ultimo, has been delayed to the last day allowed by law, with a view to render regular annual returns.

It is not accompanied, as usual, by a report, as no progress has been made in the work, and its condition remains unchanged. It is herein enclosed.

I am, very respectfully,

GEORGE NEWTON.

Return of the state of the Dismal Swamp Canal Company, on the 30th day of November, 1825.

Capital stock subscribed and paid for,		160,000 00
Amount due by Board Public Works,		000,000 00
Capital expended in the work:		
Amount of general expenditures account,	353,754 27	
Amount of stone locks account,	80,913 69	
Do. discount do.	23,768 85	
Do. contingent expenses do.	265 41	
Do. interest do.	3,473 80	
		462,176 02
Tolls received up to 30th Nov. 1824,	115,570 28	
Ditto from that time to this,	9,774 68	
		125,344 96
Officers' salaries, &c.		
M. Parks, superintendent and engineer, $1,200; overseer of workmen and lock-keepers, paid $255 during the year. A. Feret, accountant,	00 00	
Dividends declared, none at any time.		

Balance of money in hand:		
At Farmers' Bank,	230 63	
At Bank United States,	13 98	
		244 61
Debts due by the company, viz:		
To the Board of Public Works,	50,000 00	
To the Banks, say $50,000, stock pledged, $10,000 simple loan, and $58,500 on individual security,	118,500 00	
To sundry accounts,	16,476 42	
		184,976 42
Debts due to the Company, otherwise than on account of stock,		7,900 75

A. FERET, *Accountant.*

Norfolk, November 30th, 1825.

FALLS-BRIDGE TURNPIKE COMPANY.

Return of the state of the Falls-Bridge Turnpike Company, on the 5th day of December, 1825.

Capital subscribed,	80,521 40
Aggregate of requisitions made on stockholders,	80,521 40
Amount paid by stockholders,	76,269 42
Amount due by the Board of Public Works,	00,000 00
Amount due by individual stockholders,	4,251 98
Capital expended in the work,	76,306 29
Tolls received from 4th December, 1824, to 5th December, 1825,	1,228 29
Sums expended out of the tolls, in improvements and repairs,	653 30
Officers' salaries, and expenses of collecting tolls; treasurer $100; toll-keeper $100; superintendent $80,	280 00

All other expenses, and for what; measuring road, making the fence at toll-house, and printing,	67 27
Dividends declared, and when,	000 00
Balance of money in hand,	227 72
Debts due by the company,	21,938 29
Debts due to the company, other than from stockholders,	000 00

Sir,

Above is a statement of the affairs of the Falls-Bridge Turnpike Company. There is still something due for repairs done on the road, but the accounts have not been brought in by the contractors. Owing to the indisposition of the Treasurer, hence the reason of this report not having been forwarded sooner,

Very respectfully,
Your obedient servant,
JNO. LYONS, *President*
Falls-Bridge Turnpike Company.

To the Secretary of the Board of Public Works.

FAIRFAX TURNPIKE COMPANY.

City of Washington, 10th December, 1825.

To the Secretary of the Board of Public Works of Virginia.

Sir,

I have the pleasure of stating below, the income and expenditures of the Fairfax Turnpike Company, since the 27th of November, 1824.

Income, none; the whole amount due by the Board of Public Works having been received, deducting the discount, from the Bank of Potomac; and all the tolls forming the compensation of the toll-gatherer.

Expenditures:

Repairs,	618 50
Salary of the Treasurer,	50 00
Land condemned,	25 00
Contingent expenses,	13 00
	706 50
Due by stockholders,	50 00
Balance of money in hand,	403 13

No dividends made.
A small sum due for repairs now making.

Very respectfully,
JNO. H. REILY, *Treasurer.*

FAUQUIER AND ALEXANDRIA TURNPIKE COMPANY.

Return of the state of the Fauquier and Alexandria Turnpike Company, from 1st November, 1824, to 31st October, 1825.

Amount of capital stock subscribed,	70,600 00	
Of which has been forfeited according to law,	18,300 00	
		52,300 00
Amount subscribed by Board of Public Works,		30,000 00
Amount of payments made by the individual stockholders,		62,651 00
Amount of payments made by Board of Public Works,		22,500 00
Amount due by Board of Public Works,		7,500 00
Amount due by individual stockholders,		7,549 00
Amount of capital expended on the road,		96,526 00
Amount of tolls received from the 1st November, 1824, to 31st October, 1825,		1,313 67
Sums expended out of tolls, in improvements and repairs,		11,473 80

Officers' salaries and expenses of collecting tolls, viz:

3 toll-keepers, at $140 per annum,		420 00	
1 superintendent,	do.	250 00	
1 treasurer,	do.	250 00	
			920 00
Amount of money on hand,			000 00
Amount of debts due by the Company,			9,875 93
Amount of debts due the Company, other than from stockholders,			000 00
Amount of dividends,			000 00

TREASURER'S REPORT.

During the last year, there have been taken up of the old road between Fairfax and Buckland, a considerable distance, which was re-laid upon McAdams' plan. There has also been a new and substantial stone bridge erected over an important water course, in the place of an old wooden one taken down. These and other improvements and repairs, have necessarily thrown the trade off the road during a considerable part of the year; consequently, tolls to a small amount only could have been collected.

Of the new road now making upon McAdams' plan, from Buckland to Warrenton, and to which the funds subscribed by the Board of Public Works are exclusively applied, there have been completed during the last year, about four miles, and it is expected that the whole work will be accomplished within the time specified in the contracts.

This experiment of a road made upon a plan entirely new in the State, and now for the first time introduced, has been fairly tested; and has been found fully to answer the expectations of the most sanguine, and will justify the belief that its general adoption would produce immense advantages to the Fund for Internal Improvement, as well as the country generally. It has become the admiration of the neighbourhood, and is well worthy the attention of all friends to internal improvement.

J. MORGAN, *Treasurer.*

LYNCHBURG AND SALEM TURNPIKE COMPANY.

Return of the state of the Lynchburg and Salem Turnpike Company, on the 30th day of November, 1825.

Capital subscribed,			73,900 00
Aggregate of requisitions made on stockholders,			62,815 00
Amount paid by stockholders,			54,113 25
Amount due by Board of Public Works,			15,000 00
Amount due by individual stockholders,			19,756 75
Capital expended in the work,			67,122 27
Tolls received from 20th December, 1821, to 30th November, 1825,			12,062 19
Sums expended out of the tolls in improvements and repairs,			1,331 19
Officers' salaries, and expenses of collecting tolls, viz:			
Clerk to Board of Directors,		250 00	
Book-keeper and treasurer,		669 29	
Toll-gatherer, at the 1st gate,	953 50		
Ditto, at 2d do.	306 25		
Ditto, at 3d do.	100 00		
		1,359 75	
			2,279 04
All expenses, including damages for the road running through individuals' lands, printing, lawyers' fees, clerks' tickets, sheriffs' tickets, surveying road, directors' expenses, building toll-gates, toll-houses, &c. &c.			4,809 43
Dividends declared, to wit:			
12th June, 1822, *a* 2 per cent.		1,478 00	
12th Dec'r. " 1 do.		739 00	
12th June, 1823, 2 do.		1,478 00	
12th Dec'r. " 1 do.		739 00	
12th June, 1824, 1½ do.		1,108 50	
12th Dec'r. " 2 do.		1,478 00	
12th June, 1825, 3¼ do.		2,351 75	
			9,371 25
Debts due by the company,			3,555 07

Debts due to the company, other than from stockholders,		7,201 00
Cash in hand,		1,074 46

ALEXANDER TOMPKINS, *Treasurer.*

LEESBURG TURNPIKE ROAD COMPANY.

Return of the state of the Leesburg Turnpike Road Company, on the 1st day of December, 1825.

Capital subscribed,		84,000 00
Aggregate of requisitions made on stockholders,		50,400 00
Amount paid by stockholders,		47,707 66
Amount due by Board of Public Works,		00,000 00
Amount due by individual stockholders,		2,692 34
Capital expended in the work: All.		
Tolls received from 1st July, 1824, to 1st July, 1825,		3,267 72
Sum expended out of the tolls, in improvements and repairs,		1,844 51
Officers' salaries and expenses of collecting tolls, viz:		
Jno. Rose, president,	100 00	
Three directors, $25 each,	75 00	
Treasurer's commission for receiving and paying,	65 35	
Two toll-gatherers, at $150 each,	300 00	
		540 35
All other expenses, viz:		
For building toll-house,	283 41	
For printing,	18 75	
Clerks' and sheriffs' fees,	8 96	
Interest on $4,000, from 2d July, 1824, to 15th July, 1825,	256 02	
		567 14
Dividends de[illegible] none since July, 1824,		000 00
Balance of tol[illegible]		228 45

Debts due by the company, viz:

To the Branch Bank at Leesburg,	3,500 00	
To James M'Kendrick & Co. for making road,	53 34	
To Jno. M'Aleer & Co. for making road,	309 82	
		3,863 16
Debts due to the company, other than from stockholders,		00,000 00

E. E.

THO'S R. MOTT, *Treasurer.*

December 1, 1825.

LITTLE RIVER TURNPIKE COMPANY.

ALEXANDRIA, 12*th Month,* 3*d,* 1825.

J. Brown, Jr. Esq.
Secretary to the Board of Public Works, Virginia.

Thou wilt please receive herewith, a copy of the report of the president and directors of the Little River Turnpike company, to the stockholders at their last annual meeting, exhibiting a full statement of the affairs of said company at that time.

The stockholders approved the report and recommendation of the president and directors, and consequently authorised them to declare such dividend on the first day of April, 1825, as the funds of the company would authorise; and in conformity therewith, the Board did, on the said first day of April, declare a dividend of five per cent. or five dollars on each share, to be paid to the stockholders or their legal representatives, on and after the fifth day of the same month, of which due notice was given by Jonah Thompson, esq. treasurer of the company, in the newspapers of Alexandria, Winchester and Leesburg.

Very respectfully, thy friend,

PHINEAS JANNEY, *President*
Of the Little River Turnpike Company.

The president and directors of the Little River turnpike company, respectfully report to the stockholders,

That they have examined the superintendent's and treasurer's accounts, and find, that the receipts for tolls for the year ending the 31st December, 1824, amount to			15,970 10
There has also been received on account of Franklin Bank debt,			10 90
To which add balance in treasurer's hands pr. his account for 1823,			107 75
			16,088 75
And that there has been expended by Jas. Lewis, superintendent of the upper district, in ordinary repairs, $1026 59; and for building a toll-house, $200, which with his salary of $350, makes,		1,576 59	
And by Thomas Moss, superintendent of the lower district, in ordinary repairs, $1,939 68; for re-building a bridge over Accotinck, with an additional arch of 18 feet span, $900; extra wings to the bridge, and side walls to the road, $200; and for erecting a new toll-house, $135; which with his salary of $350, makes the sum of		3,524 68	
Paid for repairing toll-house at 1st gate,		44 00	
Do. salary of all the gate-keepers,		1,550 00	
Salary of the president, 150; and 4 directors at $75 each,		450 00	
The treasurer's commissions on $15,970 10, at 2 pr. cent.	319 40		
Ditto, compensation allowed by stockholders, for expense of collecting from gate-keepers,	40 00		
		359 40	
Paid marshal's and clerk's fees, $21 61; attorney, $10; printer's bill for tickets and advertising, $45; postage, 45 cts. hack hire, $2 50		79 56	
Amounts carried forward,		$7,584 23	16,088 75

Amounts brought forward,	$7,584 23	16,088 75
Expense of stockholders at general meeting,	34 38	
Paid Thos. Fouche, an old account that had been in dispute,	150 75	
Paid balance of borrowed money, due as per last report,	1,036 67	
Paid dividends to stockholders per treasurer's account,	3,691 53	
Paid for 12¼ shares of the company's stock, at $80, said stock having been issued in payment of interest and dividends in stock at various times at $100, agreeably to a resolution of the stockholders some years since, by which means the stock issued became larger than the capital authorised,	980 00	
		13,477 56
Leaving a balance in the hands of the treasurer, per his account examined,		2,611 19
There are also debts and property belonging to the company, as per schedule exhibited by the treasurer, amounting to $1792 48, of which we consider as good only,		762 27
		3,373 46
The company owe for dividends payable in cash,	705 81	
And for dividends payable in stock at par,	419 51	
		1,125 32
Leaving a clear surplus of funds, now on hand,		$2,248 14

The president and directors further report, that in consequence of an extraordinary freshet in the Accotinck, last summer, the stone bridge built over said creek in 1823, was partly destroyed, and the balance so much injured as to make it necessary to take it down: owing to which circumstance, and a belief that the injury done to the bridge was occasioned by the arches not having sufficient opening to give vent to the very great quantity of water occasioned by the unusually heavy rains at that time, the board determined on re-building the bridge, with an additional arch of 18 feet span, and accordingly contracted for the building of a good bridge, to be built with stone, under the direction of the superintendent of the lower district, to consist of three arches, one of 24, one of 18, and one of 12 feet span: the abutments and piers to be 4 feet thick; the whole to be done agreeably to contract drawn up, which has been completed for the sum of $900, to the satisfaction of the board.

The president and directors further represent to the stockholders, that the balance now on hand as profits, has accrued since the first of April last, to which time the last dividend was put off, and the board consider it a subject worthy of the deliberation of the stockholders at their present meeting, whether it would not be advantageous to grant the power to the president and directors, to declare such dividend as the state of the affairs of the company would justify, on the first day of April annually.

The objection to the plan heretofore generally pursued, of declaring the dividend by the stockholders at their general meeting early in January, is, that nearly the whole expenditure for repairs is made during the summer and autumn, when but little toll is received; consequently, at the end of the year there can be but a small sum in the hands of the treasurer to divide; whereas, during the winter months, very considerable sums are received for tolls, and very little expended; by which means the board would be enabled on the first of April, to make a dividend correctly.

In the present instance, the board respectfully recommend to the stockholders, the propriety of authorising the president and directors that may be elected for this year, to declare such dividend as the state of the funds may admit of, on the first day of April next, payable on the 5th of said month; by which time, it is believed, there will be sufficient to pay five per cent., judging from the receipts of last January, February, and March.

All of which is submitted.

PHINEAS JANNEY, *President.*

Signed,

CHARLES LEWIS,
GEORGE CARTER,
WM. H. FITZHUGH,
REUBEN JOHNSON, } *Directors.*

Alexandria, 7th January, 1826.

MANCHESTER AND PETERSBURG
TURNPIKE COMPANY.

Manchester, 1st Dec. 1825.

Sir,

In obedience to instructions from the directors of the Manchester and Petersburg turnpike company, I beg leave to present the following as their annual report to the Board of Public Works:

The first section of the road continues to maintain the character given of it in the report of last year. Even during the past winter, when by an unexampled continuance of heavy rains, many of the best roads were rendered nearly impassable, this section presented every reasonable facility to travelling, nor have the repairs upon it exceeded a few cart-loads of gravel, if we except a new flooring to a wooden bridge thrown over Mr. Cheatham's mill canal. This is the only wooden structure upon the section, and when no longer fit for use, will doubtless be re-placed by an arch, for which rock is very conveniently situated.

During the whole of winter, as well as a considerable part of the spring, the company's labourers were able to effect very little of permanent improvement on the unfinished part of the road. The materials were hardly ever sufficiently dry for transportation, nor the ground for sustaining heavy-loaded carriages. By using temporary facilities, they were enabled to render the road merely passable, and even that was accomplished with great difficulty.

As the impediments to the passage of carriages had been peculiarly felt, over a low flat adjoining Proctor's creek, extending about five hundred yards, it was deemed highly necessary to guard against a recurrence of such evils, by finishing this portion of the road, before sending the hands to the neighbourhood of Petersburg. As soon, therefore, as the weather became sufficiently open, they proceeded to its completion, by forming deep and spacious side ditches, raising the bed to a suitable height, and applying a thick covering of excellent gravel, by all which it may now be considered as finished in a style of durability, that precludes all further hazard of inconvenience in passing over it.

About the time these operations were going on, the two large wooden culverts on the central section were taken up and re-placed by others of durable materials, one being of brick, and the other of stone. The stone culvert was a very expensive structure. From the great and sudden depth of the valley it traverses, it was deemed necessary to give the trunk a length of eighty-eight feet, and to annex to each extremity, check walls, extending upwards of fifty feet, with a height of eight feet, and a thickness of three feet, in order to support the immense mass of superincumbent earth, and to secure a sufficient width on the top, after the necessary allowance for slope towards the sides.

It was not till the month of May, that the labourers were sent on to the southern section, nor would their removal to that station at an earlier period, have been productive of any advantage, since the bedding of the former year, dreadfully torn up during the long continued rains, had hardly then acquired the necessary firmness for receiving a covering of gravel.

Since that time, they have been steadily engaged in gravelling, or in graduating the hill at Swift Creek. The application of gravel has been a most laborious and tedious employment, as well from the manner it was necessarily dug, as the great distance it behove to be transported, during a season, too, of unusual heat.

Of this section, five miles are gravelled and finished, leaving one and two third miles subject to further operations. This fractional portion is very inconveniently situated for gravel, but fortunately requires little. Indeed, the greater part of it is over a firm, sandy soil, where it may well be doubted whether gravel would be of any real utility.

Two very strong stone abutments have lately been erected at Swift Creek, with front walls of thirty feet in length, rising thirteen feet above the ordinary level of the creek, and leaving an opening of seventy-two feet, to receive a superstructure of timber twenty-four feet wide, supported by two intermediate trussels. The wooden work is contracted for, to be finished by the first of February. The whole of this bridge, when completed, will cost about $1850, and should the company, at some future day, deem it advisable to substitute stone arches in the place of the wooden platform, these abutments will be perfectly calculated to support them, and so far abridge the expense of an entire stone bridge.

For reasons adduced in a preceding report, the concise financial view now to be exhibited, will embrace, as well the debts falling due at the close of the present month, as those that are already payable: and

FIRST.

The amount of capital stock subscribed, including that held by the Board of Bublic Works, is	$75,900 00
Aggregate of requisitions made on individual stockholders,	67,900 00
Amount paid by individual stockholders,	63,030 69
Amount that will probably be soon collected from individual stockholders,	682 00
Amount paid by the Board of Public Works,	4,000 00
Amount of tolls received from 1st December, 1824, to 30th November, 1825,	1,930 00

SECOND.

The total expenses in carrying on the company's operations, from their commencement to the close of the present year,	81,411 62
Deduct amount of debts payable on or before the 31st of December, 1825,	10,249 00
There remains the amount received, settled and paid away, including the tolls,	71,142 62

THIRD.

Debts due the company, from	
The Board of Public Works,	4,000 00
Sundry stockholders, and expected to be paid soon,	682 00
For tolls, payable 31st December, 1825,	100 00
	4,782 00
Deduct the aggregate from the amount of debts then due by the company,	10,249 00
There will remain an amount due from the company, beyond their immediate resources, of	5,467 00

FOURTH.

Annual salaries of agents:

To the senior overseer,	225 00
To the second overseer,	165 00
To the third overseer,	144 00
To the toll-taker, (exclusively of fire-wood, estimated at $25,)	300 00
To an assistant,	72 00
To the clerk and accountant,	80 00
	$986 00

Encumbered with so large an amount of debt, possessing comparatively a very slender revenue, with expensive operations yet remaining to be performed, the Directors are unable to see by what means they will be enabled to complete the work committed to their management, without further assistance from the Legislature. But when they advert to the great amount already furnished by the stockholders, the very limited aid hitherto afforded by the public, to *this*, compared with many other institutions of a similar kind, its proximity to completion, the liberal interest it promises for the capital embarked, and above all, the comfort, safety, and accommodation it offers to travellers, as well as those engaged in transporting the heavy commodities of the country, they feel a strong confidence that the representatives of Virginia will not permit their enterprize to languish from want of funds.

Their present calculations of the sum necessary for completing the road, do not vary materially from those heretofore presented to the Board of Public Works. In relation to this branch of the report, they deem it important to remark, that from the termination of the gravelling near Proctor's creek, to the southern extremity of the middle section, a distance of upwards of three miles, the road runs entirely over a sandy soil, from whence the thin loose surface being thrown off, a firm substratum is brought into view, which, while it gives sufficient resistance to the pressure of carriage wheels, is at the same time very easy for horses to travel over. The portion of road so situated, they are clearly of opinion, would not have its value diminished by gravel being withheld from it; nor does the contiguous country furnish it.

In excusing the Company, then, from applying it, the Legislature would subject the community to no injury, would hasten the completion of the turnpike, and very materially abridge the expense thereby to be incurred.

From all these considerations, the Directors indulge a hope that the Legislature will be disposed to exonerate them from gavelling this part of the road; and they look with the greater confidence for such indulgence, from reflecting, that under the general turnpike law, a covering of stone or gravel is required only "where necessary."

I am, with great respect,

Your obedient servant,

JAMES HENDERSON, *President.*

MONONGALIA NAVIGATION COMPANY.

Return of the state of the Monongalia Navigation Company, on the 22d day of November, 1825.

Capital subscribed,	$35,000 00
Aggregate of requisitions made on stockholders,	21,350 00
Amount paid by stockholders,	20,937 20
Amount due by Board of Public Works,	412 80
Amount due by individual stockholders,	00 00
Capital expended in the work,	19,952 20
Tolls received since the last return,	000 00
Sums expended out of the tolls in improvements and repairs,	000 00
Officers' salaries, and expenses of collecting tolls, viz:	
Directors, $216; clerk, $48; treasurer, $20; stationery, prior to 1823, $2 50,	286 50
All other expenses, and for what:	
Expenses of agent to Richmond,	50 00
Dividends declared, and when,	00 00

Balance of money on hand,	00 00
Debts due by the company, not ascertained,	*00 00
Debts due to the company, other than from stockholders; in hands of former treasurer,	671 00

J. M'CALLY, *President.*

Teste,

JONA. JACKSON, *Secretary.*

* There are some other demands which have not been liquidated.

POTOWMAC COMPANY.

Return of the state of the Potowmac Company, on the 1*st day of August,* 1825.

	Capital subscribed,	355,111 11
	Aggregate of requisitions made on stockholders,	355,111 11
A.	Amount paid by stockholders,	336,551 10
	Amount due by Board of Public Works,	00 00
	Amount due by individual stockholders,	932 20
B.	Capital expended in the work,	336,551 10
	Tolls received from 1st August, 1824, to 1st August, 1825,	9,766 66
	Sum expended out of the tolls in improvements and repairs; in expenses of collection, officers' salaries, &c.	234,699 99

Note A.—The difference between the amount paid by the stockholders, and the aggregate of requisitions made on the stockholders, arises from loss on United States' 6 pr. cent. stock taken at par from the State of Maryland as its subscription of 130 shares at 130*l.* stg. in 1799,	5,551 18
From the balance unpaid on 30 shares, which became forfeited to the company,	12,076 63
From the amount due by individual stockholders,	932 20
	$18,560 01

Note B.—The "capital expended in the work," here, means only the st[illegible]aid up. The total expenditure includes this, as well as the [illegible]ived and loans effected.

Officers' salaries and expenses of collection per annum,	2,100 00
Dividend declared 2d August, 1802,	3,890 00
Balance of money in hand,	6,294 41
Debts due to the company, otherwise than on account of stock,	16,914 62
Debts due by the company, principal and interest this day,	196,230 94

E. E.

ROBERT BARNARD, *Treasurer*
Potowmac Company.

Office of the Potowmac Company,
GEORGETOWN, 1st August, 1825.

* * *

GEORGETOWN, 5th Dec. 1825.

To J. BROWN, JR. *Richmond.*

SIR,

Herewith I beg leave to hand you, for the use of the Board of Public Works of Virginia, and in the form prescribed, the information required, relative to the affairs of the Potowmac company, as extracted from its books by the treasurer and clerk of the company.

Very respectfully,
I remain, sir,
Your most obedient servant,

J. MASON, *President*
Potowmac Company.

RICHMOND DOCK COMPANY.

RICHMOND, December 7th, 1825.

J. BROWN, JR.
Secretary to the Board of Public Works.

SIR,

The operations of the Richmond Dock Company during the year ending on the 30th ulto. were necessarily limited: the balance of tolls received, after applying what was required for the salaries of the officers, and the interest on the loan from the Board of Public Works, being the only means to pay for improvements. A good deal of excavation and filling in, was however done: some addition to the stone wall was made: the draw-bridge at 18th street erected, and such an increase in the depth of the water in the Dock obtained, as to enable the free use of the works by all vessels that can come to Rocketts. The treasurer's statement is herewith reported. It shews that the receipts from tolls are gradually increasing; the sum which accrued from 30th November, 1824, to 30th ulto. exceeding the amount which accrued the year before, by $2,450 66. The prejudices adverted to in the former reports as existing against the Dock, and the opposition of persons, who apprehend their interests will be injuriously affected by its success, still continue; and it cannot now be doubted, that time and experience of their uselessness, will alone finally remove them: but the directors look forward with confidence, to a regular, though gradual increase, 'till the whole trade of the place shall at last centre in the Dock, and realize all the anticipations of its usefulness and productiveness heretofore formed.

Respectfully,

J. B. HARVIE,
President Richmond Dock Company.

Return of the state of the Richmond Dock Company on the 6th December, 1825.

Capital subscribed,	250,000.00
Aggregate of requisitions made on stockholders,	250,000 00

	Amount due by individual stockholders, as heretofore reported,	4,615 93
A.	Capital expended in the work,	335,789 82
	Tolls received from 30th November, 1824, to 30th November, 1825,	7,835 54
	Officers' salaries, &c. superintendent, $1000; collector of tolls, $750; clerk and treasurer, $500; lock-keeper, $250 per annum,	2,500 00
	Debts due by the company, other than the amount received on loan from Board Public Works,	41,718 94
	Debts due to the company, otherwise than on account of stock,	516 50

E. E.

H. BAKER, *Treasurer*
Of the Richmond Dock Company.

A.—All expenses of whatever description are herein included.

◆

ROANOKE NAVIGATION COMPANY.

WELDON, 26th November, 1825.

To the Board of Public Works of the State of Virginia.

Under the instructions of the Board of Directors of the Roanoke Navigation Company, I herewith transmit to you their annual report to the stockholders, with accompanying documents.

I am, very respectfully,
Your obedient servant,

A. JOYNER, *Secretary to the Board.*

Return of the state of the Roanoke Navigation Company, on the 5th day of November 1825.

Capital stock,		$387,000 00
Aggregate of requisitions made on stockholders,		356,040 00
Amount paid by stockholders,		331,598 61
Amount due by Board of Public Works of Virginia,		000,000 00
Amount due by Board of Internal Improvement of North Carolina,		000,000 00
Amount due by individual stockholders,		24,441 39
Capital expended in the work, to 5th November, 1825,		325,263 65
Tolls received from 1st November, 1824, to 5th November, 1825, nett amount,		97 80
Sums expended in repairs and improvements,		115 25
Expenses of collecting tolls,		41 90
Officers' salaries:		
1st Superintendent,	1,480 00	
2d Ditto,	700 00	
Treasurer,	400 00	
Clerk,	300 00	
		2,880 00
All other expenses, and for what:		
Work still progressing,		000 00
Dividends declared, and when,		000 00
Balance of money in hand,		13,977 62
Debts due by the company,		4,091 18
Debts due to the company, other than from stockholders,		2,717 26

By order of the Board of Directors,

A. JOYNER, *Secretary.*

5th November, 1825.

Report of the Board of Directors to the Stockholders of the Roanoke Navigation Company.

We beg leave to refer you to the reports of the superintendents of works on the upper and lower river, for information as to what has been done for the navigation during the last year. By them it is shewn, that the sluicing operations have been extended to the head of Talley's falls, on the Staunton, and to the head of Hyco falls, on the Dan; that important operations have been made at Danville, and that the lower river has been improved from Williams' to Bell's bar, about twenty-five miles below Weldon. These reports, together with the accounts and vouchers of the superintendents, are laid before you, as is also the treasurer's report. All of which we ask to be considered as a part of our annual report.

We have nothing to offer to the consideration of the general meeting, other than the appointment of the officers of the company, and the usual examination into its concerns. The subject of locking into the river, was, by a resolution of your's at our last meeting, postponed to the present meeting. Upon it, the directors have no new observations to make, except by certain resolutions of the Board of Internal Improvement of North Carolina, one of the difficulties connected with the original proposition of that board, has been removed. By it you will perceive, that the application of the $25,000 is not restricted solely to the lockage, as was formerly proposed, and that any surplus which may remain after effecting that object, is applicable to any other improvements which the company may have in view.

A copy of these resolutions is laid before you.

CAD: JONES, *President.*

SNICKER'S GAP TURNPIKE COMPANY.

Return of the state of the Snicker's Gap Turnpike Company, on the 8th day of April, 1825.

Capital subscribed,		84,375 00
Aggregate of requisitions made on individual stockholders,	64,375 00	
Do. made on the Board of Public Works,	20,000 00	
		84,375 00

Amount paid by individual stockholders,	63,254 46	
Amount paid by Board of Public Works, through deposit in the Farmers' Bank at Winchester,	20,000 00	
		83,254 46
Amount due by the Board of Public Works,		00 00
Amount due by individual stockholders,		1,120 54
Capital expended in the work, exclusive of funds from the Board of Public Works,		82,555 93
Tolls received from the 8th day of April, 1824, to the 8th day of April, 1825,		517 75
Sums expended out of the tolls, in improvements and repairs,		42 18¾
Officers' salaries and expenses of collecting tolls, viz:		
Treasurer's commission,	10 35½	
Gate-keeper's salary, (for part of the year,)	75 00	
		85 35½
All other expenses, and for what:		
Allowance to the treasurer for extra services,	140 00	
Expenses at the several meetings of the board,	28 39	
Postage of letters, &c.	00 81½	
Writing paper,	00 50	
		169 70½
Dividends declared and when,		00 00
Balance of money in the hands of the treasurer,	503 18½	
Do. deposited in Bank,	282 68¼	
		785 86¾
Debts due by the company, exclusive of interest,		15,803 28¾
Debts due to the company, other than from stockholders,		[illegible]

A true copy from the books of the Snicker's G
company.

N. C. WI

To the president and directors of the Board of Public Works, Richmond.

Herewith I send you the report of the state of the funds of the Snicker's Gap turnpike company. You will perceive that the debts due by the company are $15,803 28¾ cents principal; the interest and principal will far exceed $20,000; and could there be some way devised by your honorable board, to relieve the company from their present debts, it is confidently expected that the stock would be profitable. Your board will perceive that our tolls are very small; but, that has been in consequence of our not being able to collect from but one gate, (the road heretofore being in an unfinished state.) The road being now nearly finished, we will, in the course of two months, be in the receipt of full tolls.

Your's respectfully, &c.

D. CASTLEMAN, Jr. *President.*

January 2d, 1826.

SWIFT-RUN-GAP TURNPIKE COMPANY.

Return of the state of the Swift-Run-Gap Turnpike Company, on the 3d day of December, 1825.

Capital subscribed by individuals,	69,700	00
Commonwealth of Virginia,	4,100	00
Board of Public Works,	46,000	00
	119,800	00
Aggregate of requisitions made on stockholders,	69,700	00
Amount paid by stockholders,	68,689	00
Amount due by Board of Public Works,	00,000	00
Amount due by individual stockholders,	1,011	00
Capital expended in the work,	127,202	56
Tolls received from 1st December, 1824, to 1st December, 1825,	4,064	93
Sums expended out of the tolls, in improvements and repairs,	8,413	56

Officers' salaries:

Secretary and Treasurer, per annum,	133 34
1 gate-keeper, $200; 1 gate-keeper, $150,	350 00
1 overseer,	220 00
All other expenses,	000 00
Dividends declared since last return,	1,476 00

Debts due by the Company:

To sundry persons, for the surplus of their stock, which was sold for the instalments due thereon,	186 23
To sundry persons, for negro hire for the present year,	190 50
Debts due to the Company, other than from stockholders,	000 00
Balance of money on hand,	1,046 30

Wm. ALLEN, *Secretary and Treasurer.*

WELLSBURG AND WASHINGTON
TURNPIKE COMPANY.

Return of the state of the Wellsburg and Washington Turnpike Company, on the 25th day of November, 1825.

Capital subscribed by individual stockholders,	11,650 00	
Capital subscribed by Board of Public Works,	5,000 00	
		16,650 00
Aggregate of requisitions made on stockholders,		16,650 00
Amount paid by stockholders, (by Board of Public Works included,)		14,477 59
Amount due by the Board of Public Works,		00,000 00
Amount due by individual stockholders,		2,367 59
Capital expended in the work,		13,534 49

Officers' salaries:	
Superintendent, $300, Treasurer, $328, Clerk, $300,	928 00
All other expenses:	
Attorney's fees, court charges, books, stationery, &c.	246 49
Debts due by the Company,	231 39

JOSIAS REEVES, *President.*

Attest,

Wm. Patton, *Clerk.*

REPORTS

OF

C. CROZET, PRINCIPAL ENGINEER.

1.

Summary report of his operations in the year 1825.

To the President and Directors of the Board of Public Works.

Gentlemen,

Having been prevented by sickness, from completing my reports, I can only have, at present, the honor of giving to your honorable body, an account of my operations during the last year.

Before I left Richmond, I gave my attention to the platting of the survey, and to the location and estimates of the continuation of the canal along the margin of James river: it was with much regret that I found it out of my power to lay this work before you during the session of last year, but there was not sufficient time to complete it with that degree of care and accuracy which previous circumstances, as well as the importance of the subject recommended in its investigation, and with such perspicuity as would enable others to understand readily my plans and calculations in all their details, and to compare with ease any part of them with the field notes.

About the middle of April, as soon as the season permitted, and under the direction of the members ex-officio of your honorable board, I surveyed the routes which appeared practicable for a navigable canal between the Appomattox and Willis's river. After this I made several surveys for a like purpose, between Deep creek, and also Hudsmouth or Sallee's creek and the Appomattox. These completed, I returned to Richmond, where I found a letter from the Commissioner of the Kanawha Road and Navigation, who having become convinced of the propriety of adopting my suggestions in regard to the plan of the locks at the Blue Ridge, requested me to furnish him with plans and specifications. For this purpose, I delayed my departure, and made two copies of my plan, one of which I sent to him; the other I have deposited in your office, not only as a plan of the locks at the Blue Ridge canal, but also of the locks I would recommend in the continuation of the canal from Maiden's Adventure to Covington.

Before I left Richmond, the route for a canal at Bosher's dam down to Manchester was also surveyed. I likewise examined the canal up to Maiden's Adventure falls.

About the end of June, I set out for the west. The surveys preparatory to the location of roads from Romney to Clarksburg; from Clarksburg to the Ohio; from the mouth of Fishing Creek to Morgantown, and thence to Smithfield, Pa. on the Yoghoghany, were successively made.

While in this section of the State. I examined Tygart's Valley river, and the improvements on the West Fork of the Monongahela.

Having, under the act of the 8th of March, 1824, to examine the improvements on the Kanawha, I left Clarksburg on the last days of August, for Staunton, where a survey was immediately undertaken for the purpose of ascertaining the best route for a road between Staunton and Callaghan's. After having examined all the practicable routes, and left instructions to Mr. Wilson Fairfax, my Assistant Engineer, I went to examine the canal at the Blue Ridge; thence, accompanied by the Commissioner of the Kanawha Road and Navigation, I set out for the Kanawha. I carefully examined the turnpike, and also the improvements in progress on the Kanawha. I then returned to Staunton, and, all the surveys in that quarter being completed, I returned to Richmond, taking in the way another examination of the canal, from Maiden's Adventure down.

I arrived in Richmond in the latter days of October. I had calculated that two months would be sufficient to finish all my reports and maps, and I was in hopes that I should have them ready for the time of your meeting, but in this I was unfortunately disappointed, in consequence of a severe attack of sickness, from which I am not yet perfectly recovered. During a whole month I have been compelled to suspend my labours. The maps are, however, nearly all in a sufficient state of forwardness for your inspection; and I hope I shall soon be able to lay many of my reports before you.

I have the honor to be,

Gentlemen,

Your most obedient servant,

C. CROZET, *Principal Engineer.*

10*th January*, 1826.

2.

ON THE IMPROVEMENTS OF THE WEST FORK OF THE MONONGAHELA RIVER.

When I viewed the dams in 1824, the object of my examination was to ascertain whether the contractor had complied with the terms of his contract; this I found he had done, and I reported accordingly. I thought it also my duty to express my opinion, that the plan was not calculated to answer its intended purpose; for the reasons on which this opinion is founded, I beg to refer to my report. New circumstances which have taken place since, induced me last summer, while I was at Clarksburg in the vicinity of the works, to ascertain by a personal inspection, what was then their actual state. This in the beginning of August last, was as follows:

The Company, or Chapman's dam, partially carried away in 1824, had been repaired, but in a manner which appeared insecure. The water in the pond, was about 3½ feet below the top of the dam, and the lock entirely out of use.

The dam No 7 had lost its slope; its lock will probably not stand another freshet; the dam itself leaks much, and is not safe against the power of a flood; the pond was five feet below its top.

No. 6, or Wood's dam, was entire, but leaked considerably: its foundation although rock, is far from safe. The ledge on which it rests had been broken off just below its face, and enormous fragments weighing several tons lifted out of their place and pushed forward by the stream to a distance of from 60 to 100 feet below the dam. The water was about 4 feet below the top of the dam. The lock was not finished.

No. 5, at Shin-town, has been swept away, excepting the abutments and saw mill.

No. 4, at Reeder's, much injured.

No. 3, nearly all carried away.

No. 2, was never raised.

No. 1, is but little injured. The pond had sunk several feet below its top. From the almost incredible power of the freshets to which this river is subject, it is evident, that works of a much more substantial nature should have been constructed; while on the other hand, the evident deficiency of water during the summer months, ought to preclude the thought of incurring such an expense for a doubtful object; for, as I have had occasion to remark in my former report, there is certainly not water enough at all times, for the double purpose of navigation and machinery.

All of which is respectfully submitted.

C. CROZET,
Principal Engineer.

10*th January*, 1826.

3.

ON THE IMPROVEMENT OF JACKSON'S RIVER, BY LOCKS AND DAMS,

(In a letter of the Principal Engineer to a member of the Board of Public Works, transmitted to the General Assembly by order of the Board.)

Dear Sir,

In your letter of the 19th instant, you ask for my opinion on the improving of Jackson's river by locks and dams. I have given much attention to this subject, as being part of the report required of me on the improvement of the James and Jackson's rivers. In this report, which the unfortunate circumstance of my sickness has delayed, I suggest the expediency of improving Jackson's river by locks and dams.

This system of navigation is certainly imperfect, and far inferior to a continued canal, but would, I conceive, be preferable for the present, in point of economy. The object of a continued canal is to secure to a lively trade, speed, safety, convenience and certainty, and in those respects it is also the cheapest mode of improvement, when a sufficient trade exists. But it does not appear that for the present, any thing more than the possibility of a navigation to create a trade is desirable on Jackson's river. The comparative expense of the several modes of improvement, being one of the most important data to determine the decision of the question, I have made an estimate of a continued canal, and of a series of locks and dams. As to a sluice navigation, the great fall of this river places it out of the question.

The continued canal I found would cost a little upwards of $600,000, at which sum it will sufficiently answer my present purpose to state it.

As to the lock and dam navigation, I have supposed a system of low dams, each to raise the water four feet. The length of the river from the mouth of Dunlap's creek, is 24 miles;

fall in this distance 220 feet; and its mean width at such sites as would be eligible for dams, probably 225 feet.

Each dam, I estimated at about $ 500, and each lock, such as would suit batteaux, also at $ 500, which makes $1000 for every four feet fall of the river, and consequently $ 55,000 for the whole river from the Cow Pasture to Covington.

I prefer low dams, because they are less liable to injuries in freshets; high dams, on this account, require to be built in a very substantial manner, with considerable abutments, and therefore cost much more. They form deep ponds, not so easily navigated, and without some extra work the approach to the lock through them becomes dangerous when the water attains a certain height; whereas, in the same swells, a low dam may be passed over without using the lock. But the chief consideration in favor of low dams, is, that the locks through them may be made upon a very cheap plan, being little exposed to accidents when submerged in times of freshets. High locks, on the contrary, unless expensively built, will stand in great danger of injuries under the same circumstances: such locks, besides, would require the attendance of a lock-keeper at each dam, and thereby create a considerable yearly expense; whereas, the management of the light gates of low locks might, with less inconvenience, be entrusted to the boatmen themselves, under proper regulations. The only advantage of high dams, is, that the greater stillness of their ponds in small rises of the river, would be more favorable to the up-stream navigation.

In common cases, dams must be made, according to localities, from two to three feet higher than their intended lift, in order to allow of a depth of three feet below them. For example, a dam to raise the water four feet, must be made very nearly seven feet high, since each dam must raise the water three feet at the base of that immediately above. This circumstance, which would generally increase considerably the expense of such dams, does hardly exist any where on Jackson's river; because the fall of this river is great, and not gradual, but occurs mostly in places separated by smooth sheets of water; so that it will, in general, be practicable to build a dam towards the head of one of these abrupt falls, and to excavate at a small expense, the pit of the lock: this excavation having to be carried only to a very short distance, before a depth of three feet is obtained.

The height of many of these low dams on Jackson's river, will, therefore, not exceed by more than a few inches, the four feet to which they are designed to raise the water; the river, when low, being but a few inches deep at the ripples, and the bottom being commonly rock. In order, however, to make a safe estimate, I have supposed that each dam must be made five feet high from the bottom.

After having premised the foregoing remarks relative to the plan I would recommend, it remains only for me to give you the reasons upon which I found its expediency, and to show that, even in the event of the opening of the lateral canal hereafter, the expense of locks and dams will not have been thrown away.

The object in cutting a canal along James river, and a turnpike across the Alleghany, is to establish a channel of commercial intercourse between the Ohio and the Atlantic. Such a scheme requires, however, some time to receive its full execution, and obtain a complete success, and the trade will take its new direction only by gradual steps. The turnpike now ends at Covington; an outlet for the trade must be made, or else the advantage of the turnpike will be limited. If boats could reach Covington at all times, the turnpike would become more profitable, and a new impulse would be given to the trade.

Should the canal be opened along Jackson's river now, it would cost at least $600,000, as above stated. And, estimating at 8 per cent. only, the interest of the funds appropriated to it, together with the yearly repairs, and other expenses, the sum of $48,000 would be the annual cost of this canal; but, for several years, until the trade shall have taken this new channel, the revenue must necessarily fall short of this sum. If we suppose this period to be six years, for instance, which is certainly not unreasonable, it will appear that the whole sum sunk during this time, would amount to $288,000, to which must be added the interest of the funds during the time of building; stating this time at four years, the interest would be about $18,000, which raises the whole amount to $306,000.

Whereas, if a lock and dam navigation be opened now, and the importance of the trade should require in six years the construction of a continued canal; and the locks and dams were then sold; the sum expended during these six years, instead of $306,000, would certainly not amount to even $55,000, (the original cost of the dams,) for, the sum produced by their ultimate sale, and above all, the great convenience they would afford in transporting materials for the canal, would vastly exceed the aggregate expense of their yearly repairs. Consequently, the improvement of Jackson's river by locks and dams, at the same time that it would open an immediate outlet for the trade at this extremity of the turnpike, would not be a lost expense, but would, on the contrary, prove a real economy, if after a few years, in consequence of the increase of the trade, it should become expedient to open a continued canal. This improvement is, therefore, a safe experiment, which will, in a great measure, test the expediency of the whole scheme, and accelerate the intended result of the undertaking; and it cannot be doubted that the tolls received will, in a very short time, be fully equal to the interest of the sum expended; especially if it be recollected that tolls are to be paid, not only on Jackson's river, but also at the Blue Ridge, and at the Maiden's Adventure section; so that three sections will contribute to defray the expense of this single one. Admitting that 10 per cent. on the original expenditure would be requisite to pay the interest of this sum, as well as the yearly repairs, the whole amount to be obtained from the three sections just mentioned, would be only $5,500.

The foregoing statements and observations, embrace, I hope, all the points of enquiry presented in your letter.

Respectfully,

Your obedient servant,

C. CROZET.

Major J. M'Laughlin.

NOTE.—In looking over the above letter, I perceive that I stated the fall at 220 feet, instead of 230 feet, which is the actual measurement resulting from my survey. This, of course, would add $2,500 to the estimated cost of locks and dams, and make it amount to $57,500.

4.

On the Canal from Richmond to Maiden's Adventure.

On the 11th of June last I examined the canal up to Maiden's Adventure. A breach had taken place some time before below Chevallie's mill; it was then repaired. The frequent breaks at this place were evidently owing to the convex bend formed by the canal, and to its bank having been built on a rock sloping at a great angle, without taking several necessary precautions; and among others, that of blasting off the slope of the rock in level offsets, and of securing the puddle against abrasion.

I was convinced last winter, when I saw this breach, and the manner it was closed, that breaks would often occur at the same place, unless it was stopped up in a different way. I have understood that it broke several times afterwards. It has lately, however, been repaired in a manner which, from the description given to me by the Commissioner of the James and Jackson's rivers, will probably prove safe; these breaks, so often repeated, are not generally known to have been at the same spot.

Thence to the old bed of Tuckahoe creek I did not see any thing remarkable, except some leaks and a sinking of the bank just above the old locks, which threatened a breach at that place.

At the eastern mouth of Tuckahoe creek it was found necessary to take up the flood gates, which I noticed as insecure in my report of last year, (p. 105.) Instead of these gates, which proved useless, a broad waste was substituted: it was then building. The foundations are solid rock, and it is presumed that this work will answer a very good purpose. I should, however, have advised the use of water proof cement in its construction.

For want of a freer use of this important material, the lower wall of the lock in Bosher's dam, being immediately under the pitch of the water, had been greatly injured. Masonry in common cement cannot stand in water, unless it be so carefully built as to be capable of resisting without any cement at all; for that will ultimately be washed away when made of common lime and sand.

The work to close Bosher's dam was progressing: the difficulty of this operation had been much increased during the winter. The great body of water forced with tremendous rapidity through the sluice left in the dam, had excavated the bed of the river to a considerable depth; this new obstacle, together with the dangerous rapidity of the current, the contractor had to contend with. This manner of carrying on the construction of a dam progressively from one side to the other, may answer on small water courses, but not across such streams as James river. If the dam had been raised gradually to successive levels, as was done at the Blue Ridge, or if there had been left an adequate number of openings of convenient dimensions, to be all closed easily at the same time, the difficulties which attended the completion of this dam would have been obviated.

The guard lock at the entrance of Tuckahoe creek, one side of which had fallen in during the winter, had been re-built: the percolation of water which I noticed last year in the former wall did not appear through the new one, which I am therefore inclined to think much better built. The gates of this guard lock were then unmanageable, owing to their not being carefully framed, and the planking acting as *draw* instead of *push* braces: the gates had swagged and dragged so heavily on the floor, that, as I was told, it required 8 or 9 men to open them.

I was sorry to find that the eastern corners of the abutments of that handsome structure, the Tuckahoe acqueduct, were cracked; this seemed to indicate that the work of the foundations is not uniform in its resistance, and probably in its construction.

The work at Beaverdam creek was progressing, and the building of the dam at Maiden's Adventure had been resumed.

I visited the canal again on the 27th of October, on my return to Richmond: I found, with great satisfaction, that the dam at Maiden's Adventure was completed, and preparations were making to let the water into the canal.

The improvements at Beaverdam creek were very nearly finished. Early in the spring, I had, on this subject, a meeting with the Commissioner, and a new plan was devised to get rid of this creek, which appears less liable to objections than the former one. Instead of receiving the creek into the canal, and depending on the power of its current to force the sand over a broad waste, constructed on the lower side of the canal, as described in my report of last year, the new plan contemplates getting rid of the sand, and of the water of the creek in common times through large iron pipes, placed under and across the canal. Experience has already demonstrated the efficacy of these when the creek is low. Over these pipes, and across the bed of the creek, the canal is floored and reduced to 16 feet in width: it is contained between two dams, the lower one to answer as a wasfe, the upper one to prevent the sand and other trash brought down by the creek from encroaching upon its bed: it is expected that the sand will generally be stopped by the dam on the upper side, and forced progressively through the above mentioned iron tubes. Should, however, an extraordinary swell throw some sand over this upper dam, it is supposed that, owing to the narrowness of the canal, this sand will not have time to spread, but will be pushed forward towards the waste, through which flood gates will favor its escape.

In order that the navigation may not be interrupted in a swell of the creek, as must inevitably have been the case according to the former plan, a guard lock has been built immediately after the crossing of the creek: this guard lock wanted only the painting of the gates to be complete when I saw it.

Some paving has been done near Governor Pleasants's; more will probably be found necessary.

The aqueduct at Dover was perceived to leak; as a temporary remedy, a bank of clay was making inside of it when I viewed it. This contracts the canal too much, and some more permanent plan will have to be resorted to. The defect of this work is not peculiar to it, and I cannot too often repeat that the use of common, instead of hydraulic cement, where it comes in contact with water, will ultimately prove the destruction of the most important works of masonry. This mistaken economy I noticed in my report of last year. Where there is not room enough on the crown of an arch to cover it with a bed of clay, the parapet walls and the crown of the arch ought invariably to be built and grouted in hydraulick lime.

The wall which had tumbled down below Dover had not been re-built; a paved slope has been substituted; fewer breaks, I hope, will take place, when perpendicular walls have been generally re-placed by paved slopes.

The crevices in the abutments of the Tuckahoe aqueduct had not then increased, but I have understood since from the Commissioner, that they had suddenly extended to the very top of the wing-walls. From this circumstance it may be hoped that the sinking is in the foundations of the wing-walls, and not of the abutments of the arch.

The guard lock just below was in perfect repair; its gates had been mended and improved by the addition of balance beams.

I was struck with the thick growth of weeds which obstruct that part of the canal which has been shaped out of the old bed of Tuckahoe creek. This I fear will prove a serious inconvenience; and it may be prudent to adopt such measures as will eradicate the evil before it communicates to the other parts of the canal.

At the time of my first examination, the waste which was building instead of the flood gates at the eastern mouth of Tuckahoe creek, was completed: it will greatly relieve the guard lock just below.

Between my two examinations, the wall above the old locks tumbled entirely down. This wall, originally too weak, had been propped up by heavy buttresses; wall and buttresses came down together.

This is a practical demonstration, that dry walls are, in general, very little to be relied on, and are greatly inferior to paved slopes. The bank and walls at this place had been rebuilt, when I was last there.

The foregoing are all the new circumstances worth noticing, which came under my observation when I viewed the canal. It has been completed and improved during the year, and it is most probable that accidents will not now be so frequent as they have been: in noticing those which have happened, I have taken care to point out their causes, as an evidence that such failures do not necessarily attend the opening of a canal, but may be for the most part avoided or prevented.

As to the locks from the basin to the dock, they have been for a long time in bad order, and even if they were in perfect repair, so great a number of them connected together, could never be compatible with an active trade. Still it might, perhaps, not be expedient to sell the surplus water resulting from their being disused, and thus to forego the power of establishing hereafter, a better combined communication between the canal and tide water, which may become very desirable when the improvement of the James and Jackson's rivers shall have given a new activity and more certainty to the trade.

C. CROZET, *P. E.*

19*th January*, 1826.

5.

On the Canal in the Blue Ridge.

I arrived at the fork of the North Branch and James River on the 27th of September, and proceeded to the examination of the canal, which I found to have progressed along the whole line with an amazing rapidity.

The first section, from the North Branch to the Big Balcony, was very near its completion. Two strong piers extend from the guard lock to very near the North Branch, from which the guard lock itself is not far distant. It had been, at first, intended to build this lock opposite to the dam; and it does not appear that any advantage has been gained by removing it so high up. I should, on general principles, choose to place a guard lock as near as possible to the end of the level pond of water out of which the feeder is taken; since, in that case, the embankment which precedes the guard lock need not be so carefully made, and there is a longer reach of still water before it, to afford protection to the boats, which by some cause or other may be compelled to stop at the entrance of the canal.

The embankment along the whole of this section, appears to have been very faithfully executed: it is protected all the way, either by perpendicular walls, which were mostly raised in the beginning, or by slope walls, which I had the satisfaction to see had been latterly adopted, in preference to upright walls, to secure the outside of banks against abrasion. These slope walls, or pavings, are executed with a degree of regularity, which cannot fail to impress the mind with confidence in the safety of the work.

I saw the dam soon enough to observe its interior; it appeared substantially built. A lock consisting of two dry walls, lined inside with tight planking, had been made through its northern end to keep the navigation of the river opened, while the canal cannot be used.

The guard lock looks well; it was finished when I saw it. I could therefore not form any positive opinion of its interior construction. From what I understand, however, I fear that the walls, which are six feet thick, will prove too weak in some places. In my specifications, it was stated for those places at an average thickness of 7½ feet.

The contractors for this section, are Messrs. J. Jordan and J. Irvine.

In this section the canal crosses two runs, for which, in my report of last year, I had estimated two culverts: they have not been constructed. The small height attained by the canal, at these places, rendered the erection of the culverts difficult, and consequently expensive; especially the upper one, which, at the lowest estimation, would have cost $ 2,200. Not having seen these two creeks when swelled by rains, I cannot judge with certainty how far the economical views which dispensed with the culverts, were proper. But, judging of the power of the upper creek, from the great quantity of large stones accumulated at its mouth, and considering, besides, the impossibility of making a waste at or near this place, to get rid of a swell of the creek, I should certainly have advocated the building of a culvert.

As to the lower creek, the omission of a culvert over it, is of less consequence; it being practicable to make a waste opposite or near to it: still it would have been more prudent to pass it under the canal.

From the Big Balcony to the place where the river is crossed, the canal has been contracted for by Messrs. John and Robert Gamble, except two locks, which are to be built by the contractors of the first section.

Three locks of this section were in a great state of forwardness; the others not yet begun. The work, so far as it had progressed, was very carefully executed. The stone of the facing is handsome, but not very hard; it appears, however, to harden very fast by exposure to the air.

The excavation and embankment had progressed with much activity, and appeared very well done.

The outside of the bank is mostly protected by slope walls, which are laid out with a care and perfection that can hardly be exceeded. The appearance of this work is truly beautiful.

At the end of this section, the river is to be crossed in its own bed with the help of a towing-bridge, which will also answer the purposes of travelling. This bridge was not begun; it is to be made on a cheap plan; I should prefer it with stone piers. The final selection of its site was one of the objects of my last examination. Its abutments will serve as protecting pier-heads to the lower locks on the north side, and to the entrance of the canal on the south side.

The third section of the canal on the south side of the river, is the work of Messrs. L. & S. Brown. The greater part of the excavation and embankment below the Cushaw falls was completed, and appeared substantial. The outside paving was not, indeed, so handsomely done as on the two other sections; but it answers its object.

A double culvert was building over Snow creek: only the abutments and middle pier were up. The arches are very small, and do not present together as large an opening as might have been obtained with a single arch; to which may be added, that the middle pier obstructs a great part of the water way of the creek, and the head of the culvert is immediately under the pitch of a considerable cataract. As I could not perceive any motives for the location of this work, I gave it as my opinion, that it had better be taken up and re-built upon another plan: I presume, however, that it was completed as begun. This culvert is built of rough masonry, and in common lime.

The contractors were just laying the foundations of one lock. The stones of the face were thin, and formed a very small joint, and the stones of the backing were round and very small. A wall so built, would of course depend only on the cohesion of the cement, which, being composed of common lime and sand, is a very precarious dependence in a hydraulic work. Upon the objections made to this defective work, the contractor readily agreed to remove it; and I have since received a letter from the commissioner, who expresses himself as follows on this subject:

"After parting with you at Callaghan's, I proceeded to the canal; I was glad to find that the Browns had redeemed their character as to the second lock: I found they had been very careful, and had made this lock the best on the line of canal."

The same contractors had entirely completed another lock, the outside of which looks well: Whether or not the inside was well built, I could then not judge: any opinion on this subject would therefore be but conjecture.

During the past year, some changes were made in the location of this last section.

The first change was occasioned by a new measurement of the fall, which disagreed with the former levellings: The whole fall being now made 36 feet instead of 37½, the number of locks was reduced from five to only four, which have been made of equal lift. The two last locks being connected, it would have been proper to have given them about one foot less lift than to the preceding ones. The reasons why such a difference should exist, are fully explained in my report of last year, page 132.

In consequence of the number of locks being reduced to four, less distance was requisite at the lower end of the canal; and it was agreed, when I visited this section, to drop the canal into the river by two connected locks, opposite the lower extremity of Piney island, instead of extending it 660 yards farther, as was contemplated last year.

Another modification of the plan was made at the entrance of the canal above the Cushaw falls, in consequence of a difficulty which occurred with the contractors, and which will be better understood from the following communication I received from the commissioner on the subject:

"I have just returned from Brown's line of the canal; he is progressing very well; but I find I will have difficulties with him. He complains that, when he made his estimates for making the canal on the location of the same, which was shewn to him, he made his contract accordingly: that he considered that there was nothing to be made by the prices set forth in the contract for blasting that kind of rock; but that he expected to make himself safe by using the rock in making the walls. Consequently, he denies the right under the contract, of changing the location so as to give him rock to blast of a different description, and in a different situation from that which was shewn to him, and compelling him to do it for the same prices. He refuses to have any thing to do with the right arm of the river above what was shewn him, for any reasonable compensation."

Upon re-examining the crossing place above the Cushaw falls, I found that the plan might be so modified, as to do away the objections of the contractors, and also lessen considerably the expense.

There is just above the Cushaw falls, a long stretch of still water, at the upper end of which the canal was intended to begin; but the contractors, having found near the lower extremity of this pond, a place where the shore might be approached at low water, had proposed to cut the canal from it; by which means they would avoid the blasting of a long channel out of the hard rock, which they objected to. But, considering that the proximity of the entrance they proposed, to the Cushaw falls, would render it dangerous during a swell of the river, I proposed the following plan:

To make two entrances for the canal, the one at the lower end of the pond where proposed by the contractors, to be used only at low water, when boats can get to it without danger: The other, at the upper end of the pond, where originally intended, to serve when the river is swelled; the canal between the upper and lower inlets, being excavated only one foot deep; so that a rise of two feet in the river, would give it three feet depth of water when it might begin to be used. This modification of the plan was agreed upon to the satisfaction of all parties; it will save 2½ feet in the depth of blasting of a channel of considerable length out of very hard rock, and mostly under water. This is exactly the same plan I had proposed at the entrance of the canal below the North branch, but which does not appear to have been understood at the time: It will often be found practicable and advantageous when a feeder is taken out of a long pond of still water, whether natural or artificial, and especially when the excavation at the head of the feeder is attended with great difficulties.

Just above the upper inlet, there is a most eligible site for the towing bridge.

The locks along the whole line, have been made of the dimensions I had recommended last year, viz: 76 feet long in the clear, and 10½ feet wide. The commissioner of the Kanawha Road and Navigation, being ultimately convinced of the propriety of these dimensions, wrote to me last spring for plans and specifications which I furnished him with. One lock on the south side, and the guard lock on the north side, were begun before these were received, and differ a little from my plan.

A copy of this plan of locks has been deposited by me in the 2d Auditor's office: on it, will be found the dimensions of all the parts very minutely set down.

Upon the request of the commissioner, I made also an estimate of what the difference of price should be between a lock 10½ feet wide, constructed after my plan, and a lock 16 feet wide, built upon the usual plan on the lower canal. My calculations, made as favorable to the contractors as I thought reasonable, brought out a difference of $ 1,100, between two locks of 8 feet lift. This point has not yet been settled with the contractors.

It is a matter of regret, that hydraulick lime has not been yet discovered in the vast limestone district, above the Blue Ridge, and that the locks could not be made throughout with this important material. As it is, the contracts require Roman cement to be introduced only six inches back into all the joints of the face, the rest being built with common cement and grout. The imperviousness of such walls is more than doubtful; and percolation once established, it is to be feared that the common lime of the backing may be gradually washed away, and the stability of the work endangered. I do not think that water proof cement ought to be any where less than one foot back into the joints, and it should extend deeper into the wall towards its base. I would greatly prefer to sacrifice some of the external beauty of the work, by dispensing with cut stones wherever it is merely ornamental; especially as I think that a cut stone face rather weakens than strengthens a wall; and to apply this economy to a more liberal use of hydraulick lime, whether discovered in the State, or imported from New-York. Locks and aqueducts are too important, and also too difficult to repair without considerable injury to the trade, to admit of parsimonious views in their erection.

I regret, that while every body who views the canal will praise its good execution, I am not permitted to overlook some circumstances, which, though they cannot affect the strength and permanency of the work, are not in harmony with a sound economy. I am sorry to be compelled to notice again, this year, the unnecessary width of the canal in several places. This defect was already remarked upon in my report of last year (page 107;) it existed at that time but at a few places in the upper section, the greater part of it being then only staked out. Still it was apparent, from the situation of the stakes, that the bank would be too low down the declivity of the hills, and that an unnecessary width, and consequent expense would thereby be produced. I made a few observations on this subject, in my report, with a hope that they might be productive of some benefit and improvement to the work. From the Flat Rock up to the North Branch, especially, nothing at that early period had been done; for the whole distance the ground slopes gently and pretty uniformly; the stakes did not indicate more than four or five feet depth of cutting; whence it was apparent that the canal would be too low down the declivity, and that the high embankment there required would be unnecessarily increased. It was therefore suggested verbally to the gentleman who was then Engineer of this upper section, that it would be expedient to remove the centre of the canal higher up the slope of the ground, whereby the depth of cutting would be increased, the height of the bank diminished, and excavation and embankment would be brought nearer to an equality. I afterwards made all the necessary calculations and diagrams for the purpose of ascertaining the cheapest line of excavation of this section. I found that above the Flat Rock, an average depth of cutting of eight feet would be the most advantageous. This I purposely stated, at three different places in my report, (in pages 128, 133 and 134,) with the additional remark, that a location in four or five feet of cutting might actually double the expense of the high embankment which must be raised there.

When I viewed the canal this year, I was concerned to find, that things were, nevertheless, as I had feared they would be. The bank has been placed so low down the declivity, as to require an extraordinary width of excavation to raise it to its proper height. An error of this nature increases very fast the solid contents of a high embankment, the height of the puddle wall, and the outside slope wall. At this place, besides, it has the additional disadvantage of contracting the water way of the river near the dam. The unnecessary width of the canal is remarkable almost all the way from the guard lock down to a short distance below the Big Balcony, and is particularly striking about this cliff, where the extra expense incurred must have been very considerable.

Below the Big Balcony the location has been managed, as far as the work has progressed, with a proper regard to economy, except at one place above the third lock, where the width of the canal, without any apparent motive, greatly exceeds the dimensions of 30 feet, fixed by law. There is, indeed, another place below the same lock, which might appear to possess the same defect; but the gentleman, who is now Engineer of this section, explained the circumstance to me, as being produced by the discovery made there of a good bed of clay which had been dug out and transported elsewhere.

A mistake of an opposite nature has been committed on the south side in the vicinity of Snow creek. There the canal has been thrown too deep into the hill. This not only places the culvert immediately under a cataract, as mentioned before, but has also occasioned a very considerable quantity of unnecessary excavation, mostly through very hard rock. The defect is indicated by the extraordinary width of the bank at this place, and an evident waste of materials. It appeared to me, that the object of the location there had been to give a straight direction to the canal; but this regularity becomes a defect, when it is obtained at so much expense.

C. CROZET, *P. E.*

11*th February,* 1826.

6.

On the Kanawha Turnpike Road.

This road, from Covington to the falls of the Great Kanawha, is very nearly ninety-four miles long: it passes through a very broken and rugged country, particularly beyond Lewisburg; the western section of it, almost from the Sulphur Springs, is much the best; its execution and convenience are praised by all those who duly appreciate the difficulties it had to contend with: it is universally thought to be equal, if not superior to any road of the kind that has been made in this country over ground as difficult as that it traverses. Still it is not without some defects, most of which, however, may be easily corrected.

The first most striking defect, is a want of width in places, particularly on this side of Lewisburg, which has been the cause of much complaint, and even of a pretty current opinion that it was not made according to contract. I have therefore enquired into this fact, and convinced myself that the road is every where, as far as practicable, within the provisions of the law, and of the contract made by the former commissioners and John Caruthers; and that most of it is even better made than required by this instrument.

The act of Assembly of the 17th February, 1820, relative to the turnpike, and the suggestions contained in the report of the Engineer to which this act refers, (4th annual report of the Board of Public Works, page 48,) formed the basis of the contract, which may, strictly speaking, be said to have complied with them. The specifications of this contract in respect to the width of the carriage-way, are as follow:

"This part of the road, say 22 feet in width, is to be graduated and made level from side to side;" "and it is to be raised by earth towards the centre, by a regular curve which shall be twenty inches higher at the centre above the base or horizontal line, than it is on each side of the said twenty-two feet when first made;" "and on each side of the road except on hill sides where there is no bank below to hold up the water, there must be a regular and smooth channel or gutter to carry off the water which may drain either from the road or the adjacent lands." "The side ditches are to have a very gradual slope, say not exceeding twenty-five degrees towards the road, and on the other side, the banks terminating in these ditches, are to be cut so that their slopes shall not exceed forty-five degrees."

From these specifications, it will appear evident to every person who has examined the road with some attention, that through level ground it is made as here described, and indeed it is seldom as narrow as required by the above instrument. Along hill sides, indeed, its width is frequently reduced; but not under the limit of eighteen feet authorised in difficult places by the act of Assembly quoted above; still, notwithstanding it is made according to contract, the road is in places too narrow. This is owing to the width of twenty-two feet being, from the shape given to the road, but partially the actual carriage-way; though it would appear from the former Engineer's report, that he intended that the whole of the twenty-two feet should be the carriage-way, having probably in view a somewhat different plan from that described in the contract. This imperfection of the road, arises chiefly from its being too much raised in the centre; and as it is an error very frequently fallen into, it may not be amiss to give it a fuller illustration, for which purpose I have prepared the annexed diagram from the above-recited specifications.

This diagram exhibits the shape of the road through level ground: from the lines thereon represented, it appears that a regular curve twenty-two feet between its extreme points, and rising twenty inches in the middle, would incline eighteen degrees to the horizon at its extremities. This inclination is too great for a carriage, one wheel of which, on such a slope, would be about eighteen inches above the other. A great part of a road so shaped, is consequently almost impracticable for carriages. Experience has taught, that a carriage would cease to move with ease along the side of a slope greater than five degrees, or inclining one foot to the horizon to about 11½ feet base; on such a slope, the upper wheel is about six inches higher than the other. By a reference to the diagram, it will be seen, that beyond a width of 11½ feet in the middle of the road, a carriage would be on a greater slant than five degrees, and consequently as carriages will naturally keep within the limits wherein they move with safety and convenience, it must appear that on a road so shaped, there is actually only 11½ feet of true carriage-way; the rest being rather part of the side ditches.

For the purpose of draining a road, so great a height in the middle is certainly unnecessary; a few inches will suffice, if the water can escape at all to the sides, which ruts will generally prevent; and here it may be observed, that the very means taken for getting rid of the water the quicker is rather calculated to prevent it; for, when the side of the road has so great a slant, carriages moving on it will rest heavily upon their lower wheel, which will cut a deep rut, by which the water will be stopped and collected. It is consequently difficult to conceive, for what motive roads are generally so much raised in the centre: No road should be raised in the middle more than 1-24th of its breadth, or half an inch to each foot of its width. Upon every part of such a road, carriages will travel with convenience, and the road will not so soon be cut.

Had I construed the law relative to the shape of the road, I should have measured a width of twenty-two feet, given it a height of only ten inches in the middle, instead of twenty, and dug ditches outside to furnish earth wherewith to shape the road; the sides of the ditches next to the road inclining not more than twenty-five degrees to the horizon. By this means the whole width of twenty-two feet might have been used by carriages; and consequently the road would have been found wide enough, although twenty-four feet appears to me a rather more eligible width. It is not, however, too late to correct this defect of the road wherever it exists; which may be done by taking some earth out of the side-ditches for the purpose of raising the road on the edges in order to lessen the side slopes.

The rounding of the road is still more objectionable in declivities. When a road inclines forward, say, for instance, at five degrees, the greatest slope of the sides partakes then of the longitudinal and cross-slopes, and exceeds considerably both; so that a carriage moving down along the edge of the road, is naturally drawn off obliquely from the straight direction, which is particularly dangerous in turns, and icy places. In consequence of the danger they would be exposed to, waggons will naturally avoid the edge of the road; which, for this reason, is virtually narrower than its actual dimensions. To this must be added, that the road will soon be cut across at its edges by heavy torrents flowing down it. In such cases as this, I would make the cross section of the road flat, or only very slightly curved; depending upon occasional gutters to turn the water which will always run down the road, whatever its rounding may be. In the case of a road cut out of the side of a hill, the preceding remarks obtain likewise, with this only difference, that the surface of the road should incline towards the hill, especially in turns, by which means carriages will rather incline towards the hill than the precipice. These modifications might be introduced in a great many places without much labor. From Lewisburg to the Kanawha, the road, with the exception of a few places, is generally better shaped, and sufficiently wide.

There is another circumstance, which is much complained of, and supposed not to be done according to contract. In all places where the road is cut out of a precipitous hill-side, it is held up by logs. As must have been expected, these have already given way in places, and most of the made part of the road has sunk with them; by which occurrence, the road is made very narrow at such places. Still, this manner of upholding the road, not only was stipulated in the contracts, but was also the most judicious that could be used; for, in these places, stone suitable to build walls with was seldom convenient; and even if it had been so, the difficulty of building it would have been considerable, and its expense greater than that of cutting the road entirely out of the hill-side; and after all, supporting walls along so precipitous hill-sides would be a very unsafe improvement. To cut the whole road at once out of the hill, might, perhaps, at first appear the best way to proceed: but, two reasons support the plan that was pursued. In the first place, the trees, being on the spot, are a cheap mode of propping up the road, and before they rot, they allow of part of the rubbish getting cemented, both by natural cohesion and by vegetation; and in the next place, it happens frequently among these hills, that rocks, at first very hard and difficult to cut through, when exposed to the air disintegrate and crumble to pieces, whereby the gradual widening of the road is greatly facilitated.

The small size of the gutters to carry off the water from the road is a just cause of complaint: but I do not perceive in the contract, any precise specification relative to their construction. Almost all the gutters will have to be made anew, on a plan similar to those which exist between Gauley bridge and the end of the road, which are a very good model: between that point and Lewisburg, some few of the same make are now and then found; but, in general, the gutters along the whole road, are too narrow, abrupt and deep, and occasion dangerous jolts to carriages. Gutters should be made in proportion to the quantity of water it may appear probable that they will have to pass; and they ought to be so shaped, as to be crossed without a jolt, their edges being united to the road by a very gradual curve; for which purpose, I do not think that any of them could, with any convenience, be made less than eight feet wide; whereas, they are often as narrow as three or four feet.

Gutters are particularly necessary on declivous roads to get often rid of the water, which, if suffered to accumulate and course along a road, would soon cut it up. But, unfortunately, they have been much neglected along the numerous hill-sides pursued by the road, and it is impracticable to make them after the road is completed, without increasing its declivity near them: they should, therefore, always be located, in graduating the road along a hill-side, by leaving level offsets for the purpose, at proper places, not exceeding 150 yards apart. These offsets are, besides, convenient resting places for ascending carriages, and check the speed of descending ones.

In one respect, indeed, the construction of the road differs from the provision of the law and the contract. In some places, the grade of five degrees has been a little exceeded; but, in several instances, it was almost impossible to do better; and in others, it happens merely accidentally, at some few spots where slight undulations were made in cutting the road: these places might easily be reduced to the proper grade. Although I consider that five degrees is in general too steep for a road, I am on the other hand convinced, that through the very broken country traversed by the turnpike, it has required no small degree of dexterity not to exceed this grade oftener. On this head, however, I would observe, that the grade of four degrees ought, I think, to be the maximum declivity in a short turn.*

Having considered, in the foregoing account, the execution of the road, as it stands in relation to the contract, I will conclude the statement of the improvements of which it is susceptible, with some remarks on a defect which exists at many of the bridges in the most mountainous section. It happens frequently, that where bridges have been thrown over deep ravines, the road descends towards the bridge at an inclination of five degrees, and that the slope has been extended quite to the bridge, which is very objectionable on several accounts, and especially when, as is not unfrequent, the direction of the bridge forms a short turn with that of the road. On a declivity of five degrees, waggoners are compelled to lock their wheels, and generally cross the bridge with locked wheels. The commissioner recommends the adoption of a law against it. But, can waggons coming down a declivity of 5 degrees, stop and be unlocked? The only remedy I can find to this, is, to raise the bridges where practicable, so as to leave a level space between their abutments and the descent of the road, on which space waggons might be unlocked. This should always be carefully attended to in locating a road in such situations; and, indeed, it would be still better to give a small rise towards the bridge, by which means water would be kept away from the abutment, instead of collecting near it and forming there deep muddy places, which become a cause of injury both to the bridge and the waggons.

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* Since writing the foregoing remarks, I have found in the first vol. of the pro- edings of the Board of Public Works, the report of Mr. Baldwin, relative to this road: it contains excellent suggestions, which, had they been made the basis e contract, would have produced a perfect road, free from the defects noticed e.

To resume; a gradual attention to the following improvements will in a short time render this road much better. 1st. To take up, and make over again, all the defective gutters. 2d. To diminish gradually the rounding of the road, where it is inconvenient. 3d. To widen the road out of the hill-side, wherever slips have taken place.

As to the general location of the route of the turnpike, it would be impossible to give a positive opinion of it, without having explored the whole country it traverses. So far, however, as the eye can reach in this mountainous country, the road appears to have been located with a most scrupulous attention to economy; its windings along hill-sides follow closely the least expensive track; this, in several places, produces rather ungraceful bends, and sometimes abrupt turns; a few of the latter might be straightened to the greater convenience of the road, at no very great expense.

In sight of Covington, the road ascends a considerable hill, to avoid some difficulties in the valley of Dunlap's creek; it soon descends again into this valley, and crosses the creek three times on bridges of considerable length. One of these bridges gave way during last summer, and had to be re-built; another shewed symptoms of a similar fall, but was propped up in time. This accident was owing to the too considerable bearing given to the longitudinal beams stretched across the stream, which were each composed of two very long beams touching each other at their ends, without any scarfing, and wholly united by a framing above: the whole being only composed of narrow split pieces, without any horizontal cross-braces, was not capable of resisting any lateral pressure, (a circumstance too often neglected in bridges); and the whole bulged laterally. The new bridge has been better framed, and the string pieces made of stronger dimensions, and overlapped at their junction in the middle of the bridge. Still, the span is, I think, too great for a flat bridge.

At several places before the road reaches the Sulphur springs, large stones appear occassionally in it, which will have to be picked out, and as far as Lewisburg all the gutters are bad. From the springs to Greenbrier river, the road keeps in the valley of Howard's creek, which it crosses three times; it cuts deep in places.

Greenbrier river is crossed over on one of the most splendid wooden bridges ever built. The bridge consists of two spans of 211 feet each, supported by two abutments, and a middle pier very handsomely built of hewn stone. In a work of this importance, however, I should have considered the use of mortar in the abutments a trifling addition of expense. The under part of the bridge is 25 feet above the river; each span is composed of two strong lateral frames, and a middle one, forming between them two road-ways, each of 10½ feet in width; the whole width of the bridge being 26 feet. The frames are connected together at their lower part, by the cross horizontal ties which support the flooring, and at their top likewise by horizontal cross ties, and by the framing of the roof, which covers the whole bridge: the sides are planked over. Each one of the frames is composed of two ribs, or rather of a double rib, rising about 20 feet in the middle, and whose extremities are held together by a tie-beam or chord, also double, forming a slight bow of 3 feet sagitta. The double ribs and chords embrace strong upright posts, to which they are firmly bolted. The uprights are capped, the whole length of the bridge, by a strong beam, and braced by crosses halved together in the middle, with wedges at their junction, by means of which they may be stiffened when wanted. The cross horizontal ties, already mentioned, are placed at top, between the caps, and at the base between the chords or longitudinal ties of the opposite frames. On the timbers which connect the chords, rests a double floor, which is itself laid diagonally, and acts thereby as an additional horizontal brace; so that the whole bridge is carefully and firmly secured against lateral motion, so often fatal to bridges. In one word, the framing of this bridge has been built upon the best principles, and does the highest credit to the builder, Mr. James Moore, who, it is to be hoped, will meet with such patronage as will keep him in the State. I know of only three instances where the span of this bridge has been exceeded; it is even sixteen feet greater than that of the Schuylkill bridge.

From Greenbrier river to Lewisburg, the road is good, and generally wide enough; some rocks appear in places. Beyond

Lewisburg, Muddy mountain is passed over; many good gutters are found in this section. The road is occasionally too narrow. It then crosses successively Bushy ridge and Meadow mountain, over which it is wide enough, and comes to Meadow river.

The road through the Meadows, has been raised and capped with stones, except at the further end, which is in immediate want of a similar improvement. The capping of stone stands well, but the stones are rather too large and the road too narrow. Beyond the Meadows, and after having passed Little Sewell mountain, the small stream which has given its name to it, is crossed. Then comes Vandal's mountain, on the other side of which the Valley of Big-Sewell river is traversed. The ground there is bad; for part of the distance, a causeway has been made and capped with logs: a very considerable distance claims the same sort of improvement, or better; a capping of stone. Considerable difficulty was experienced in locating the road across Big-Sewell mountain, which rises beyond the river of the same name: the road from there to the Kanawha is a constant succession of ascents and descents. Along Davis's mountain the road keeps on the north side, where, as appears to be usual among these hills, the soil is spungy and cuts deep: it will require immediate capping with stones.

After having passed Donoho's hill, the road is very stony for some distance. Some attention to this circumstance appears urgent: passages for water are rather too scarce among these hills. Between the 24th and 8th miles this side of Gauley river, the original location has been entirely changed, as was formerly reported by the Commissioner. From the parts of the 1st location I went to examine, and the account of the number and dimensions of the bridges that would have been required on the old location, I am convinced that the change made by the Commissioner has been an advantage to the road, which, for these sixteen miles, is indeed as good as could be desired, and by far the best and most level of any section of that length.

Before it reaches Gauley river, the road descends along the New River Cliffs, where it certainly required the most indefatigable zeal and activity to find out a path for a road, and some skill to make it as good, though in many places the earth has been washed away from over the rock, which now appears naked; but 5 degrees is too steep a grade to retain made earth over ledges of rocks.

Gauley river is crossed over by a bridge composed of three arches of 160 feet span each; it is built on the same plan as the Greenbrier bridge, and by the same gentleman. This handsome monument of human skill and enterprise, at the confluence of two streams, and in the midst of a remarkably wild scenery, looks exceedingly beautiful. From the Gauley bridge to the falls of Kanawha, the road is very good; and the gutters, particularly, are made upon a plan which it is to be regretted was not sooner adopted.

From the falls, the extension of the road has been carried to only about 5 miles, through ground over which the old road was almost impracticable before. This new section was progressing well when I saw it: the road keeps necessarily in sight of the Kanawha: its location appeared to me judiciously and skilfully managed. Whether or not the further extension of the road would be advisable at present, is a question, which, being connected with the improvement of the navigation of the Great Kanawha, I will consider, after having given an account of my examination of the works on the river.

C. CROZET, *P. E.*

11*th February*, 1826.

7.

On the Kanawha River

The turnpike has opened a communication with the beautiful valley watered by the Kanawha: this improvement and that of the river, have given a new impulse to the trade. The valley exhibits a most pleasing scene of activity. Numerous waggons are busily engaged in the transportation of salt to Lewisburg. A six horse team carries, when the road is dry, about 100 bushels of salt.

The principal part of the salt, however, is as yet transported to Point-Pleasant in flat boats, which load from 400 to 500 barrels, of the weight of about 360 pounds. Some horse-boats are also used. When Mr. L. Baldwin visited the river in 1817, it appears from his report, that boats did not load more than from 40 to 60 tons.

The quantity of salt manufactured annually on the Kanawha, was stated in the supplement to the 4th annual report of the Board of Public Works, for the year 1820, to have been 500,000 bushels. From the information I have collected, it has increased to 800,000 bushels at least: According to some statements, indeed, it would exceed one million of bushels. This article alone will be a sufficient source of revenue to repay the State for the improvement.

No stream is better calculated for improvement by sluices, than the Kanawha: its fall is very small, only 108 feet in 94 miles, about 60 feet of which are above Charlestown, that is to say, in the 37 first miles; leaving 48 feet for the 57 remaining miles between Charlestown and Point Pleasant.

The river presents, from the falls down to the Ohio, a succession of long ponds of deep water, interrupted occasionally by ripples and shallow places, which it is the object of the improvements to overcome.

I examined the river in the first days of October; the works were then progressing well, but the force employed was rather small: the principal part of the men were then at Red-house shoal. The improvements have chiefly been made between Charlestown and the Ohio. The following is an account of the remarks I was able to make at the successive shoals below Charlestown:

1st. Elk Shoal, in sight of the town, and just below the mouth of Elk river, has been to all appearances formed by this stream; a sluice has been cut through the middle of the bar of gravel; its length is upwards of 800 feet; the fall is stated to be 32 inches; the velocity of the water which flows through it, is at the rate of 4 miles an hour. A wing at its upper end must be removed, and the slope of this sluice extended higher upwards, in order to lessen the current.

2d. Two-mile Shoals, below the mouth of Two-mile creek, and probably produced by it. Nothing has been done there yet. The current is strong and beats violently against the right bank. The river is here divided by an island: the left arm appears to be gradually filling with gravel. This circumstance is favorable to the improvement of the right arm.

3d. Island Shoal, at the lower end of the above island: Nothing has been yet done to it. The channel is very crooked: It crosses rapidly over from the left to the right shore, close to which, the water is very rapid. It is probable, that the accumulation of gravel near the right shore, is in a great measure produced by a great quantity of trees that have fallen from the bank into the river; and that, if they were removed, a straight sluice might be easily opened near the right bank.

4th. Tyler Shoal just below the mouth of Tyler creek, and very likely formed by the gravel ejected from the creek. A sluice has been opened through the bed of gravel close to the right bank: It is not deep enough near the head: It will have to be straightened there at a short bend which appears to cause some deposition. This sluice is filling slowly at the lower end. Some advantage might be obtained by extending the left wing lower down. The current through the sluice is at the rate of 3 miles an hour. The contract requires, that the slope of the sides of the sluices should be 45 degrees, but gravel will not stand at this angle.

From a view of the localities, it would seem that the sluice, instead of being near the right bank, immediately under the mouth of the creek, should have been located near the left shore, where the current is said to be when the river is high. It is certainly a dangerous plan to open a sluice just at the place where the probable cause of obstruction shews itself in all its strength. This sluice has stood two years, but requires some more work. Boats may be towed up it along the bank.

5th. New-comer Shoal is hardly worth noticing, there being only a narrow bar and a few rocks in the way. The most remarkable circumstance about it is, that the bar is said to be of late formation, and to be gradually increasing.

6th. Peeled-maple Shoal, requires only a little deepening, and the removal of a few rocks.

7th. Johnson's Shoal consists of two successive shoals; two sets of wing-walls below, and two at the upper bar had been done. J. Bosher's work at the upper end is intended to be abandoned, and the new sluice to be made nearer to the middle. The second rapid is to be improved by a sluice with a tow-path connected obliquely with the left bank, in order to overcome the rapid current at this place, by hauling.

8th. Tackett Shoal is generally deep enough; a few rocks are in the way; two wing-dams have been made; two others below appear necessary.

9th. Red-house shoal is the most considerable and difficult to improve; the sluice is dug close to the right shore, out of a bed of solid rock. The length of the sluice is to be 1800 feet, and the fall nearly 2¼ inches to 100 feet. Its width is a little over 40 feet. The work was much advanced when I saw it; the excavation is required to be 3½ feet deep for the whole length. This work will have been very expensive; a very considerable sum had already been expended upon it, when the new contract was made with Messrs. Epley & Morrison, which allows them $10,000 for finishing it.

It appears to me, that a wing parallel to the bank, to collect and hold up the water, and a lock of about 3 feet lift at the lower end would have been less expensive and otherwise more eligible. The objection of Thomas Moore to this plan, was, that in freshets the canal would fill with gravel and sand; but, since the sluice is necessary only when the water is low, gates at its upper end, to be shut as soon as the water should rise, would have obviated this difficulty.

10th. Knob Shoal has been improved by jetties extending out from both shores. The current through the sluice left between the ends of the jetties, is at the rate of nearly 3½ miles an hour, at low water; the length of the ripple, is about 900 yards. Successive jetties, so arranged as to divide a fall and graduate it, have the advantage both to swell the water, and check its velocity by the eddies of the intermediate pools: these pools likewise greatly facilitate the ascending navigation. Jetties answer a very good purpose when the fall at a ripple is not great, and the water not too deep below it.

The jetties which have been made on the whole river would be more permanent if some brush could have been mixed with the stones of which they are made; but, it seems there was some difficulty to procure brush of a suitable kind.

Above Knob Shoal there were several inconsiderable shallow places not yet improved. From this shoal to the Ohio, a few small ripples intervene, which have been improved.

Above Charlestown, the first shoal is Morris's; it will require some digging at the head and wings below. The next shoal above, is Witcher's creek shoal, which will have to be graduated by a sluice and wings below. These two shoals are included in Epley & Morrison's contract, whose operations have not yet reached to this point. The improvement of the river between this and the Great Falls, was undertaken by D. Smiley: The shoals included in his contract are:

1st. Cabin creek shoal: It has been improved by a canal sluice, the current through which is strong; it runs at the rate of 4½ miles an hour; it might be eased by two jetties below; its approach, however, is much facilitated by a deep eddy pond immediately below the fall, and on the side of a strong current.

From this point to Point Creek Shoal, there is only an inconsiderable ripple.

2d. Point Creek Shoal takes it name from a creek opposite to it: a sluice has been opened through it: the fall is about 4 feet; the current at the lower end, where it is most rapid, is at the rate of 3½ miles an hour. The sluice passes through smaller gravel than that which is cut through by the sluices below Charlestown, and will not probably be so permanent as the latter: already some deposition appears at the lower end: jetties below the sluice would prevent it in some measure; and, at the same time, by lengthening the fall, would smooth the current and produce an eddy, of which ascending boats might avail themselves.

3d. Childers' shoal opposite Childers' creek on the left and Morris's creek on the right. The sluice is partially dug out: I should have preferred it more towards the middle of the river, that it might be farther from the mouth of the creek by which it will be apt to be filled with gravel. Whenever a sluice is cut through a bar of gravel formed by a creek, there ought to be, I think, room enough left between the sluice and shore for the creek to vent itself out, and a high tow-path should be interposed to prevent the gravel thrown out by it from encroaching on the sluice: in addition to which the mouth of the creek should be, as much as practicable, turned down the main stream, in order that it may vent itself more freely, and send its gravel *down* instead of *across* the river.

4th. Morris's shoal next above; no work has been done there yet: the gravel is small, and to all appearances brought down by a considerable creek. It will require a sluice and wings.

The next shoal of importance above Morris's, is Loop shoal, which is included in the distance to which the road has been extended. Its improvement and that of the river above are to be abandoned.

From the preceding account, it will appear that the difficulty of improving the shoals permanently, becomes greater as they approach to the Great falls; it is more particularly so above the point to which the road has been extended. The fall per mile is greater, and the bars composed of smaller gravel, and therefore very probably subject to frequent shiftings. The doubts which may reasonably be entertained as to the success of the works intended towards the melioration of the navigation from Loop shoal to the Great falls, justify the abandonment of the undertaking; while, on the other hand, the almost impassable state of the old road down to some distance below Loop shoal, rendered it highly expedient to extend the turnpike thus far. To these considerations it must be added, that where navigation ceases, and land transportation begins, the shifting of the produce requires the attendance of agents, places of deposite, and in one word, an open ground upon which buildings may be erected: but below the falls the turnpike keeps necessarily close upon the margin of the river, and the country begins to expand only near the point to which the road has been carried; so that every circumstance recommended to shorten the navigation and to carry the turnpike a few miles lower.

In regard to the further extension of the turnpike, as it was enacted upon conditions which have not yet been fulfilled, I respectfully submit the following observations:

The improvement of the 27th and 24th miles, under Epley & Morrison's contract, will cost		2,732 00
David Smiley's contract from Slaughter's creek up to the Great falls, amounts to		8,868 00
Total expense of the improvement from Charlestown to the Great falls,		11,600 00
From which must be deducted for the section abandoned between Loop Shoal and the Great Falls, about	4,000 00	
And also, this sum paid D. Smiley, for work already done,	4,135 00	
		8,135 00
Leaving to be expended in completing the navigation up to the extremity of the turnpike, only		$3,465 00

The extension of the turnpike down to Charlestown might cost $20,000. It may, therefore, not be improper to enquire, whether commensurate advantages would be obtained. From the place where the turnpike stops at present, the road to Charlestown, though not perfect, is nevertheless quite practicable, and mostly level: so that the people of this section, as well as the trade, would be taxed, if the turnpike was extended, for an improvement from which they would not derive advantages much superior to those they now possess, since the late addition to the turnpike. On the other hand, the navigation up to Loop Shoal, presents only a few obstructions, already almost overcome, and which a small expenditure will complete. There does not, consequently, seem to be any decisive circumstance that would recommend to increase the road and diminish the extent of easy navigation; a plan, which appears contrary to the general policy of these two manners of improvement.

As to the propriety and expediency of the mode of improvement adopted on this river, I do not think that any stream is better calculated for it. In a gravelly river, whose fall exceeds an average of 4 feet per mile, and which is interrupted by numerous shoals, this system will generally procure but limited and uncertain advantages, as every freshet will subvert some part of the works: but, on the Kanawha, the shoals are few and, comparatively to other rivers, permanent. Many of the obstructions are bars of rock, through which sluices, properly located, rather assist the current than counteract its operation: such sluices will be lasting. As to the shoals composed of an accumulation of gravel, the causes of their formation appear to be of rare recurrence, or slow process; and, consequently, sluices cut through them at the place where they are least exposed to the probable cause of the obstruction, will not require frequent clearing out. Still, as they do not remove the cause by which such shoals were produced, it is beyond a doubt, that, if not attended to, they will gradually fill. But, the depositions, which will generally begin at the lower end of the sluices, being only gravel and sand, will be easily removed; and, as the shoals are but few, the occasional expense incurred to keep the channels open, will retrench very little from the considerable revenue that may be expected from the trade of this flourishing valley.

Even in the event of those formidable, but scarce freshets, which are said to rise 40 feet on the Kanawha, and by which the heaviest gravel may be set in motion, if some of the sluices should happen to fill, it would be no difficult work to clear out the loose gravel deposited. A circumstance of this kind can happen but rarely and partially; and the advantages derived from the navigation are too considerable and important to suffer the possibility of this temporary and very scarce interruption to operate as an objection against the undertaking. Horse-boats navigate the river now, and the time is probably not distant, when light steam-boats will be able to ascend it. From the measurement I have taken of the velocity of the current at the most rapid sluices, and of which I have given an account in this report, it cannot be doubted that steam-boats can stem it every where.

Respectfully submitted,

C. CROZET, *P. E.*

13*th February,* 1826.

8.

On the survey for a road between Staunton and Callaghan's.

Pursuant to a resolution of the 2d February, 1824, requiring that:

The engineer survey a route for a road from Staunton, by the way of the Warm springs, to the State turnpike road at Callaghan's, and any other route which, in his opinion, may be preferable for a road between the points aforesaid.

I examined the country between Staunton and Callaghan's, and found several routes practicable, between which, the motives of preference were so balanced, that it was only by an actual measurement, that a positive opinion could be formed. Four routes were, therefore, surveyed; which, together, make a distance of 207 miles. The field operations are comprised in three field books: on the verso pages are recorded the courses and distances, with the corresponding latitudes and departures. The recto pages contain remarks and sketches of the ground, taken at each station, by Mr. W. Fairfax, assistant engineer, with so much care and accuracy, that each page forms a small map by itself, and compares with a remarkable degree of similitude, with the general map which has been prepared from the field-work. On this map, the stations have been numbered and the miles marked; it could not be large enough to exhibit all the local circumstances sketched in the field-books, to which I therefore beg to refer, for more minute information.

In proceeding westward from Staunton, the first obstacle which presents itself is the North mountain; until a few years back, the road passing through it, at Jennings's gap, was exclusively used by travellers. This gap is remarkably level and good, but inclines too much to the north.

The travelling, of late, has taken its course through a more direct break of the mountain at the Buffalo gap. From Staunton to this opening, the road is about eleven miles long, and traverses a rolling country very favorable to the making of a road. This part is common to the four routes that were surveyed. The Buffalo gap itself is too far to the north, and causes the road to deviate considerably from the straight course; but it was ascertained, both by examination and actual survey, that this great elbow could not be avoided. There is not, in the North mountain, any other low place practicable for a road. Two depressions of this ridge, called King's and Dunlap's gap, were tried; the ascent towards Staunton is very steep and rough, and the height of King's gap, above the base of the mountain, was computed at 1500 feet. The map shews the survey made through it.

From the entrance of the Buffalo gap, two different roads may be taken, both leading to the Warm springs; the one called the Dry branch road, inclines to the north and passes over the North mountain; the other, known by the name of the Buffalo and Panther gaps road, takes a southern direction and passes through these two successive gaps; it unites again with the Dry branch road, at a distance of about five miles this side of the Warm springs; thence the road continues over the Warm springs mountain, by the Warm and Hot springs to Callaghan's.

The two other routes surveyed, lead to the latter place by way of Covington: They part from the Buffaloe and Panther gaps road, one before, the other beyond the Panther gap. The former is known by the name of Brattan's run road; the latter passes through a wilderness, and may be designated as Porter's creek route.

There is, perhaps, no part of the State so irregularly broken, as the country between the North and Warm Spring mountains: The ridges which intervene assume so many directions and names, that their connexion can be well understood only by reference to the map. In general, the ridges are high and abrupt and the valleys between them narrow. Every step offers to the sight new and apparently impassable barriers; a course approaching to a straight line is therefore utterly impracticable: it is only by very circuitous windings that passes can be found among these formidable mountains. Two pretty level, though very devious roads, have been opened and are travelled to go to the Springs.

Dry Branch Road.

This road reaches the top of the North mountain by a very gradual but rocky ascent along the Dry Branch: though the ascent is easy, the elevation is great. The road then descends into the valley of the Great Calf Pasture river: the descent is precipitous and stony, the present graduation being as much as 11½ degrees at one place; there will be some difficulty to graduate it better. For a distance of eleven miles from the North mountain the road is level; but part of it is muddy; it then passes over a short but steep ridge, the grade at one place being as much as 9½ degrees; the ridge, however, may be in a great measure shunned. Thence to the base of the Warm Spring mountain there is no considerable hill. The ground near Gen. Blackburn's and Cloverdale is bad; beyond this place it is variable, though mostly good for a common road; a bridge was building at the place where the Cow Pasture river is crossed.

The Panther Gap Road.

This road passes round the end of the North mountain, and then, through the Buffalo gap, over a slight and short ridge which divides the waters of the Shenandoah and James river: this part of it is stony. It continues down the valley of the Little Calf Pasture river, between the North mountain and Fore mountain,* which divides the Little from the Great Calf Pasture river. In this valley the road may be said to be level, the few and short ascents which intervene, being merely occasioned by the turning of the road for the convenience of the farms. The road turns round the end of the Fore mountain and takes its direction towards the Panther gap, after having crossed the Great Calf Pasture river. A survey was made along a path across the Fore mountain, by which ¾ of a mile might be saved in the distance to the Panther gap, but the leading spur on the west side was found too short to allow of a proper graduation: the map shews this survey.

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* It is also called Back mountain, by those who live west of it.

From the end of the Fore mountain, however, a straight direction may be taken to the Panther gap; two crossings of Mill creek will thereby be avoided and better ground passed over, but no material distance gained. This improvement is indicated on the map.

The Panther gap is formed by the breaking of Mill creek through Mill mountain. The road through the gap continues level, but is very rocky. The gap is nearly half a mile in length: the crossings of Mill creek in it may all be avoided without any increase of distance worth noticing. From the Panther gap the ground is good to near the last crossing of Mill creek where it is miry. Beyond the creek, the Long-spur is ascended imperceptibly; the descent on the west side is more rapid, and badly graduated: the Long-spur has been ascertained by computation to be only 300 feet high above its western base and is susceptible of a graduation at 3 degrees; it is the only hill of any consequence on this route, and affords the best sort of ground for a firm and dry road.

At a short distance from the Long-spur, the road passes by Williams's Spring, beyond which it crosses the Cow Pasture river, on a bridge at upwards of 42 miles from Staunton. From the bridge to the point where the road unites again with the Dry Branch road, the ground is more uneven than before; and the location would require great alterations to make the road good throughout that distance.

From the Fork which is nearly 45 miles from Staunton, to the base of the Warm Spring mountain, the distance is about 2½ miles; in this distance Thompson's creek is crossed several times: the first crossing alone is indispensable; the others may be avoided by taking a ridge on the left of the road, which will reach the Warm Spring mountain to advantage and pass over better ground.

The Warm Spring mountain is crossed at a comparatively low place: the road ascends along the south side of a spur to a height of 742 feet at an angle which averages 7°, but is in places as much as 9½; it then crosses over the spur and descends on the other side of it 165 feet at an average angle of 5 degrees; and lastly, it re-ascends along the face of the main mountain to an additional elevation of 395 feet, at an average angle of 4¼ degrees; so that the whole height of the mountain above its eastern base is 972 feet, and the average angle of ascent only 4¼ degrees: this grade could not be obtained where the road is now located; but, from the examination which was made, it resulted that a break near the extremity of the spur might be reached at a graduation of 5°; and that, by passing through this low place, the road might ascend to the top of the mountain at an angle less than 4 degrees; there being no longer any occasion to descend and thereby lose some of the elevation gained. This new location would rather diminish than increase the distance: it is indicated on the map.

Towards the Warm Springs the road descends only 555 feet; it has been cut, at much expense, out of a short and rocky spur; the descent averages 6½ degrees, but is as much as 10½ in places; by taking the left along the main mountain instead of the spur on the right, the ground will be found good, and any graduation may be had. A graduation of 4 degrees would lengthen the road ¼ of a mile, but the time of travelling would be lessened. This mountain, so formidable to travellers, and which constitutes the chief objection to the route by the Warm Springs, might, therefore, be passed with great convenience.

From the Warm Springs to Callaghan's,

The road passes by the Hot Springs, down the Hot Springs run and Cedar creek, which are crossed very frequently; most of the crossings might be avoided. At the mouth of Cedar creek, Jackson's river is forded; by crossing it higher up, a good site for a bridge, and a shorter road would be obtained. Immediately after having passed Jackson's river, the road ascends Morris's mountain, and then keeps on the top of it for several miles. The ascent is as steep as 10 degrees, and the height reached to about 560 feet. This steep ascent, however, may be entirely avoided, and Morris's mountain, so much complained of, may be passed almost on a level, by keeping along its southern declivity as far as a low place, where it may then be crossed over. Thence to Callaghan's, this road presents nothing remarkable.

Several other routes, leading from the Hot Springs to Callaghan's, were examined; but the present road keeps along the best track, and may be easily improved.

The Route by Covington,

Keeps along the turnpike from Callaghan's to the town, a distance of a little upwards of five miles. From Covington it passes for 12 miles through a complete wilderness. Starting from the courthouse, the route surveyed strikes a swell of the ground opposite to this building, and thereby avoids the low spungy soil by which the town is surrounded, and which makes the present road very deep in wet weather. In sight of Covington, the extreme end of the Warm Spring mountain, whose elevation there is very inconsiderable, is ascended at an angle of three degrees; after this short ascent, the line keeps nearly on a level along the declivity of the hills, and soon reaches the Pounding Mill run, up the valley of which it proceeds until it ascends the gradual slope of the dividing ridge between the waters of the run just named and Smith's mill creek; along the Pounding Mill run there are some rocky places. From the top of the dividing ridge, the ground descends very gradually towards Mill creek; it is occasionally stony.

The creek is crossed near M'Raw's gap, where it breaks through Middle or Little Mare mountain; the gap is very rugged, but not impracticable for a road: it is only one-fourth of a mile long. After having crossed the creek near the end of the gap, and ascended a small elevation, this route reaches a flat part of the mountain, from which the Brattan's run road and Porter's creek route diverge.

The Brattan's Run Route,

Leads along Wilson's creek, by Boston Hansbarger's; there the wilderness ceases, and an open road is taken. It proceeds down Shaver's run to the Cow Pasture river, which is crossed at a wide place just at the end of the Mill mountain; the ground so far is pretty good. The road continues up Sampson's creek, at the head of which it ascends a dividing ridge. The graduation is steep, and the road rocky. The elevation of the ridge is 256 feet. On the other side of this ridge, the descent towards Brattan's run is easy, but very stony; there are about 10 miles of stony and rocky road along Sampson's creek and across the ridge. The road pursues Brattan's run down to the place where it empties itself into the Great Calf Pasture river; near this point the road unites itself with the Panther Gap road. Along Brattan's run, the ground is mostly good; the run must be crossed several times. There is between Sampson's creek and Brattan's run, about 12 miles which are not settled, and are hardly susceptible ever to be so.

The Porter's Creek Route,

Passes by John Hansbarger's, beyond which place it traverses a wilderness up a branch of Wilson's creek, across a slight dividing ridge, and down Porter's Mill Creek to Adam Porter's farm: thence an open road is pursued along this Mill Creek down to its mouth, just above which the Cow Pasture river is crossed at a very eligible site for a bridge: from this point the distance is short, and the ground good to Williams's springs, where the Panther Gap road is fallen into. The whole of this route is nearly level; the dividing ridge between Porter's and Wilson's creek, is passed over unperceived: the ground is generally good; but occasionally stony along Wilson's creek.

Another way was examined to pass from Wilson's creek over to George Francisco's, on the Cow Pasture river; but this route, though it would be one mile shorter, was deemed too difficult. Wilson's mountain would have to be ascended for three miles from the Cow Pasture, at a considerable grade, which could hardly be shaped out of the steep hill sides, by which this draft is confined. This route is indicated on the map. It appears from the platting, that the Porter's Creek route approaches nearer to the Dry Branch road than I had supposed, while exploring these rugged hills. From what the map exhibits, and from my recollection of the country, I am inclined to think that it would be quite practicable to connect them. But it appears also from the map, that the connexion with the Dry Branch road would make the route somewhat longer than by the Panther and Buffalo Gaps.

From Staunton to the Warm Springs, the magnetic course is S. 79 W. and the straight distance nearly 38.60 miles. The distance by the Dry Branch, as surveyed, is 50⅓ miles; by the Panther Gap road it is very nearly 2½ miles longer. (It may be proper to observe, that in surveying, the road itself was not always pursued, but such short cuts taken as would improve it.)

From the Warm Springs to Callaghan's, the magnetic course is S. 42 W.

The straight distance 22.40 miles, and by the road very nearly 26 1-6 miles.

Which makes the whole distance from Staunton to Callaghan's, 76½ miles by the Dry Branch road, and 79 by the Panther Gap. The magnetic course to Callaghan's, is S. 65½ W. and straight distance only 58 miles.

In a former survey, I ascertained the variation of the compass to be at Staunton 1° 37' East.

The route by Porter's Mill creek and Covington, is a little over 77 miles.

By Brattan's run, it is 79¼ miles. Shewing a difference of 2¼ miles.

From the foregoing statement, it will appear that, in point of distance, there is but little difference between the routes by way of the Warm Springs and of Covington. Of the importance of connecting the State turnpike with Staunton, there can be no doubt, whether the new road passes either by Covington, or by the Warm Springs. If by Covington, 5½ miles of the turnpike are already made, and an almost level road would be obtained by way of Porter's Mill creek, the Panther Gap, and Buffalo Gap.

But on the other hand, there will necessarily be much travelling by the Warm and Hot Springs, which would lessen considerably the revenue of a road by Covington. The course by the Warm Springs is objected to on account of the difficulties presented by Morris's hill and the Warm Springs mountain; but it has already been stated in this report, that the ascent of the former may be totally avoided, and that of the latter made very easy, without any material increase of distance.

It appears to me, therefore, that the most eligible plan would be to combine the two routes as far as possible. That is to say, to make the road by the Warm Springs, and to intersect it from Covington, at the nearest and most convenient point. With this view, as well as in point of distance and ground, the route by Porter's creek would appear preferable to the Brattan's run road. And whether the Dry Branch or the Panther Gap road be selected, either may be intersected by a road from Covington, so as to have towards Staunton a section of 40 or 41 miles common with it.

The Dry Branch road is shorter by 2½ miles than the Panther Gap road: but the ground on the latter is better, and the crossings of Mill creek, with the exception of the last, may all be avoided. It does not appear that either of the two roads could be materially shortened. As to the expense of improving them to a width of 18 feet through common ground, and 15 feet along hill-sides, I have estimated it in sections corresponding to the changes of soil: the aggregate of these estimates produces a sum of nearly $17,000 for either road, exclusive of bridges. Should the present location, however, be much altered, this expense would be increased; but as no considerable distance can be gained in the narrow valleys within which the road is confined, it seems advisable to keep the improvement as near as practicable to the present road: The map indicates about all the places where a change is indispensable. The advantages of both routes appear so nearly balanced, that with regard to public benefit, it is immaterial which of them is selected.

The road from the Warm Springs to Callaghan's might be improved for $8,500, which makes $25,500 for the whole distance.

To make a good road from Covington by M'Raw's gap and Porter's mill creek, to Staunton, would cost about $23,000.

This road, though passing through about 30 miles of wilderness, amounts to less than the other, on account of 5½ miles of it, between Covington and Callaghan's, being already made; and because of the expense that would be incurred on the road by the Warm Springs for graduating the Warm Springs mountain, and making an entirely new road along Morris's hill.

The knowledge of the country I have obtained, both from surveys and personal examination, will enable me to locate the road in a very short time, on whatever route may be selected.

Very respectfully submitted,

C. CROZET, *P. E.*

February 19*th*, 1826.

9.

On Tygart's Valley River.

This is one of the Branches of the Monongalia. I began its examination at Adam See's. Between this point and Beverley, a distance of thirteen miles, there is no obstruction worth noticing. The stream flows on a bed of gravel, forming in some places inconsiderable bars. The quantity of water in this section would not allow of a navigation of more than from two to three months in the year; so that Beverley may be considered as the highest point where, if other obstacles were surmounted, the deficiency of water would not be an objection.

From Beverley to the gap where the river breaks through the Laurel Hill, it winds its way through a fertile valley, and presents long and beautiful sheets of water, interrupted only by occasional ripples. The whole of this distance would require but a very small sum, say $150, to be made navigable.

Through the Laurel Hill the current becomes more rapid, and the water consequently more shallow: at some places there are some abrupt falls of 2, 3 and 4 feet pitch; the stream is here confined between high and rocky hills. At a place called Nova Scotia, the bed of the river is obstructed by square masses of rock of enormous size, some of them being as large as common houses; among these the water escapes with great velocity. This wild section of the river is about 5 miles in length, yet it might, with judicious management, be improved for $5,000.

From the gap to the end of the settlements along the river, a distance of about 9 miles, very little labour would perfect the navigation; but, from this point down to the mouth of Buchanan river, a section of seven miles in length, it would be totally impracticable to improve the bed of the river. I never beheld a more impetuous and wilder stream: confined between steep and rocky hills covered with dark laurels, it roars among enormous fragments of rocks, and precipitates itself in foaming cataracts over the ledges which intercept its progress, some of which jut over the basin below them at an elevation frequently exceeding 10 feet. These abrupt pitches of the river are in close succession below each other. As to the plan of turning these falls by a lateral canal, the excessive steepness and ruggedness of the hills, the great fall of the river, which cannot be less than 40 or 50 feet in a mile, pronounce the idea to be chimerical.

From the mouth of Buchanan river down to James Booth's, a little above Laurel or Sugar creek, the river is without any remarkable obstacle; that part might be improved for $300. The distance is about 12 miles. From James Booth's down to the first great falls, (about four miles,) the river is rapid and studded with rocks; it might take $800 to improve it.

The great falls are about 35 feet high, 20 of which are almost perpendicular; the western bank is steep and very rocky; the eastern one is more accessible. A canal might be cut along it, the beginning of which would be through solid rock. It would not require less than $30,000 to turn these falls, which offer an admirable site for water works.

Thence to M'Daniel's ferry, the river is more placid. The distance is about 10 miles, which include the Well Falls, so named from a round hole of extraordinary depth formed in the rocky bed by the rotation of stones. For this distance $800 would suffice.

From M'Daniel's to Johnson's ferry, the river is in places rocky and rapid, but susceptible of improvement. This distance is about 7 miles. The cost might be $700.

From Johnson's ferry, near Prunty town, to the Wickweir's falls, the water is good. The distance is nearly 6½ miles.

The Wickweir's falls are the most interesting site of this river. Just above the falls, a deep pond of water will answer the purposes of a good navigation, and may be made a vast reservoir for water-works by raising a dam at the head of the cataracts. The fall at this place has been accurately levelled; it is divided into five distinct cascades, which measure as follow:

1st. A perpendicular fall of	11.30 feet,
2° Another perpendicular fall a few yards only below the first,	13.06
3° A fall of	7.03
4° Do. of	8.31
5° Do. of	10.30
Total,	50 feet.

This fall of 50 feet occurs in about half a mile, and about 1½ mile above Newsum's mill. The quantity of water which passes through the section of the stream in one second, was ascertained by measurement and computation to be 491 cubic feet, besides the quantity of water which was then turning two pair of stones at Newsum's mill. These falls are a most important site for water works. They could not be turned for less than $50,000.

From Newsum's mill there is no material obstruction; boats ascend from the mouth of the West Fork up to the mill, when the water is not low. The distance by water is about 11 miles.

From the preceding description of Tygart's Valley river, it will appear that the present condition of the adjacent country would not justify the requisite expense of improvement, and that the obstacles just above the mouth of Buchanan river will probably forever preclude any attempt to open the navigation above that point.

Respectfully submitted,

C. CROZET, *P. E.*

February 19*th*, 1826.

10.

On the survey for a canal from Bosher's dam to Manchester.

By a resolution of the General Assembly, in date of the 14th of February, 1825, a survey was directed to be made, of the most practicable and advantageous route for constructing a canal, on the south side of James river, from some point above and near Bosher's dam on said river, to the town of Manchester. It was farther required, that, in making such survey, such route be selected, as will render necessary the smallest number of locks possible.

It appears, from I. Briggs's report,* that a survey for a similar purpose, was made by himself and Thomas Moore, then principal engineer of the State. There exists a map of this survey in the Second Auditor's office; but I have not been able to find the report which must have accompanied it. It would seem, however, that the canal was contemplated to begin about two miles below the site where Bosher's dam has been since built, and that the route selected, kept close upon the margin of the river, the level being lowered successively by locks. A considerable lockage was therefore required, before the canal reached the town of Manchester. To keep a canal on a high level, for a long distance, is often objectionable; and the motives which appear to have directed Mr. Moore, in his preference of a low level, are correct in the abstract. His views on the subject are explained in his report on the Roanoke canal, (proceedings of the Board of Public Works, vol. II.); but they are not, in my opinion, altogether applicable to the present case. In the first place, the ground on the higher level is rather better than on the lower one, especially near Manchester; and in the next, a basin at this place could not be well supplied with water, nor afford any considerable water power, if locks were interposed between it and the head of the canal.

Conformably to the intention of the new resolution relative to this improvement, the level of Bosher's dam was carried along the hills as far as Manchester: it was found to meet mostly with very rocky ground; but this would also be the case if the line were lowered by locks. The level of Bosher's dam was ascertained to be very nearly 113½ feet above tide-water: it strikes exactly the level ground at the top of the hill, just at the upper end of the town of Manchester, within a few yards of the point where the Petersburg and the Coal Pit turnpikes unite. This is a most favorable site for the construction of a large basin, which, as indicated on the map, will extend from the Petersburg turnpike to the brow of the hill, between two ravines, down which the surplus water will descend into the bed of a run which crosses the low grounds below Manchester. At so great an elevation and in so favorable a situation, the basin will afford a most valuable water power. By giving a fall to the feeder, of six inches in a mile, a current of about one foot per second will be created, which, without producing any injury to the canal, will render the supply of water more lively, and obviate the depression usually occasioned in a level canal by drawing off water for turning mills or machinery. This current will favor the descending boats, which will generally be heavily loaded with coal, and it will have but little effect on the ascending boats, which will most commonly be nearly empty.

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* Proceedings of the Board of Public Works, vol. II. part IV. page 2.

One of the objections of Mr. Moore to a high level, seems to be, that it often becomes necessary to get down from the great elevation attained at the end of the canal, by connected locks; but this is not the case here; and a communication can be with great ease established between the basin and any eligible point of James river, with suitable distances between the locks. These being all located near and below Manchester, would be very easily superintended, and boats could always reach at least the town and the basin, without obstruction; whereas, if the locks were situated between the dam and the town, they might often occasion much delay and inconvenience to the trade.

The survey is comprised in a field-book, from which a map has been prepared; both will be found in the Second Auditor's office. From these documents, a minute estimate was made, an abstract of which is hereto annexed. The estimate is predicated for a canal 30 feet wide, 3½ feet deep, with a bank 10 feet wide, and raised two feet above the surface of the water. The canal will admit of boats from 9½ to 10 feet wide. The whole distance, from Bosher's dam to the basin at Manchester, is very nearly 8¾ miles on the route of the canal.

The estimate gives for the probable expense of the canal from Bosher's dam to Manchester, including the basin,

	$198,617 20
Add for superintendence, &c. 10 per cent.	19,861 80
This sum, - - - - - -	$218,479 00

will be requisite to bring the water from Bosher's dam into a basin just above the town of Manchester.

Though the instructions I received did not require me to consider the communication with tide-water, still it is so essential a part of the intended improvement, that I thought it indispensable to make an examination of the ground for this purpose. The plan exhibits the several surveys run below Manchester, with this intent: it results from them, that there will be no difficulty to carry the canal through the ground below Manchester to any point of James river; and even if thought proper, below the bar at Warwick. It must be obvious, that a mere basin at Manchester, without an improved communication with the shipping, would not answer the principal object in view, which is to afford greater facilities to the coal trade; for, in this case, it would be subject to the same inconveniences it experiences at Richmond, viz. the frequent handling of the coal, whereby its cost is increased, and it loses both in quantity and quality.

I think, therefore, that the communication between the basin and the shipping, must be regarded as an integrant part of the scheme. Several plans may be devised to effect this object: that which had been contemplated, was to have lifted the vessels from the river into a basin or dock, constructed at a place marked A, on the plan; and then to have sent the coal down into this lower basin, from another basin located on the top of a small eminence, marked B. In order to investigate the feasibility of this plan, the level sections of the hill on which the upper basin was proposed to be made, have been carefully measured, as laid down on the map; they show that the shape of the hill is not favorable to the intended object, and that there is a want of space. In addition to this, it must be considered that the vessels would have to be lifted 40 feet, which would require five large, and consequently, expensive locks. It will, therefore, be found more convenient, and less expensive, to go at once to the river with the coal boats: there a canal, of any desired length, might be made along the top of the bank, from which the coal might be transferred into sea-vessels by some simple mechanical means. The bank is about 18 feet above the river, and 91 feet below the basin; the cut along the bank might be made about the place where Heth's coal yard is situated. The difference of level between the bank and the basin, being, as just stated, 91 feet, could be overcome by 11 locks, which need not be wider than 10½ feet, nor longer than 76 feet in the clear. The map shows that the distance between the basin, above Manchester and Heth's coal yard, is sufficient to allow of a length of 300 yards for each lock and intermediate basin or reach, which is quite enough for locks of this size.

The expense of the continuation of the canal would stand thus:

For 11 locks to rise 91 feet,	$ 81,900 00
For excavation of the intermediate basins through good ground,	6,000 00
Total amount,	$ 87,900 00
Which being added to this amount of the above estimate,	218,479 00
Gives the sum of	$ 306,379 00

For the probable expense of the whole canal from Bosher's dam down to tide water.

In order, however, to make the improvement complete, some easier means of transportation must be devised between the Coal mines and the pond of Bosher's dam. For this purpose a rail-way appears most eligible: it might probably cost $ 24,000. So that the whole improved communication, from the Coal pits to tide water, would require an aggregate capital which may be stated in round numbers at $ 330,000.

As this improvement would chiefly depend on the Coal trade, there remains to enquire into the prospects it offers and the benefits it would receive from the expenditure. The most moderate statement makes the quantity of coal raised every year on both sides of James river amount to 1,300,000 bushels, out of which 920,000 are waggoned to Manchester, at an expense which is now 9 cents per bushel, but is liable to vary with the price of corn. The balance is transported to Richmond principally by the canal: there it is deposited into Coal yards, and that which is shipped is generally handled three times; this increases its cost by about 2 cents per bushel and deteriorates its quality. But, setting aside the quantity of coal brought to Richmond, the above statement establishes the positive fact that, not less than one million of bushels would be transported to Manchester by the canal: calculations founded upon this fact will, therefore, not partake in any degree of the nature of mere speculations, but possess all the certainty of an incontrovertible truth.

A good canal stock ought to produce an interest of 8 per cent on the capital, in order that, after deducting the yearly expense of repairs and superintendence, it may yield a reasonable dividend. At that rate the revenue derived from the improvement should be $ 26,400, which will be nearly produced by one million of bushels of coal paying 2½ cents toll per bushel on the rail-road and canal.

As to the expense of transportation, at the highest estimate, it will not exceed 1½ cents per bushel from the Coal mines to tide water; the coal being conveyed on the canal by boats of the dimensions stated above, each drawn by a horse. So that the cost of transportation together with the tolls of 2½ cents per bushel, will hardly raise the expense of conveyance of a bushel of coal to 4 cents; whereas, this expense is now 9 cents on the turnpike: there would, therefore, be a saving of 5 cents per bushel, besides the additional value the coal supplied would receive from a superior mode of conveyance, that would hardly occasion a loss either as to the quantity or the quality of the coal; which might be delivered in northern cities nearly as good as it is obtained from the mines.

It is consequently beyond a doubt that the stock of the contemplated improvement would be a profitable investment, even in the present state of the coal trade; and it is equally certain that it would soon manifold its value in proportion to the increase of the coal business: for, if exported with the combined advantages of a reduced price and improved quality, the Virginia coal would soon be in much greater demand in the northern States. The coal of James river is obtained so near tide water that, if properly encouraged and conducted, it would scarcely meet with any competition: The quantity raised, would, therefore, be considerably increased and the article would become a staple of infinite importance to the State.

The following is an abstract of the estimate I have made of the cost of the canal from Bosher's dam to Manchester. The entrance of the canal is at the mouth of a creek a short distance above Bosher's dam: There is much deep cutting at the beginning and much rock will have to be removed along the whole route; the prices annexed to each number of cubic yards excavated, indicate the nature of the ground at each station better than could be done by words:

	Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregates.*
From the beginning to station 3, which is nearly opposite the dam,	390	Excavation,	$12010	Cts. 18	$ 2161 80	
		Guard-lock,			8000 00	
From 3 to 8,	381	Deep excavation, rocky,	24765	30	7429 50	
8 9,	418	Do. do.	22990	32	7356 80	
9 15,	866	Do. do.	40938	35	14328 30	
15 17,	110	Common depth of cutting, rocky,	4730	40	1892 00	
17 19,	90	" "	8820	38	3351 60	
19 20,	60	" "	2100	32	672 00	
20 23,	543	" "	19005	28	5321 40	
23 26,	228	" "	9120	35	3192 00	
3 26,		Puddling,	18255	40	7302 00	
26 29,	986	Excavation, good ground,	18166	15	2724 90	
		Culvert and embankment across Rattle Snake Creek,			3000 00	
						66,732 30
29 31,	486	Excavation of earth,	13608	20	2721 60	
31 33,	139	" "	1808	15	271 20	
33 34,	110	" "	1980	18	356 40	
34 35,	96	" "	768	20	153 60	
35 37,	213	Excavation of rock,	2769	40	1107 60	
		Puddling,	1491	40	596 40	
37 38,	113	Excavation of earth,	1243	20	248 60	
38 39,	71	Excavation, rocky,	923	40	369 20	
		Puddling,	781	40	312 40	
39 44,	478	Embankment along th[illegible]ase of a steep hill,	8748	25	2187 00	
		Puddling,	2734	40	1093 60	
						9,417 60
Amount carried	forward,	. . . .	.	.	.	$ 76,149 90

		Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregates.*
Amount	brought	forward,					$ 76,149 90
From 44	to 47,	220	Excavation, rocky,	$7480	Cts. 35	$ 2618 00	
47	49,	176	" "	6158	40	2463 20	
44	49,		Puddling,	4356	40	1742 40	
			For a waste,			400 00	
							7,223 60
49	53,	280	Embankment across Gilbert's Creek Valley,	12296	25	3074 00	
			Puddling,	3080	40	1232 00	
			Culvert,			900 00	
53	55,	139	Excavation, rocky,	1808	35	632 80	
55	56,	80	Embankment,	1250	25	312 50	
53	56,		Puddling,	1553	40	613 20	
			Farm bridge,			300 00	
							7,064 50
56	61,	440	Excavation, rocky,	5060	30	1518 00	
61	62,	83	" "	650	35	227 50	
			Embankment,	244	25	61 00	
			Waste			320 00	
62	65,	140	Excavation, rocky,	1540	30	462 00	
56	65,		Puddling,	4525	40	1810 00	
65	66,	50	Excavation of earth,	900	15	135 00	
66	67,	214	Across Rock-Spring branch ravine, excavation,	1742	25	435 50	
			Embankment,	4384	25	1096 00	
			Puddling,	880	40	352 00	
			Culvert,			1500 00	
							7,917 00
67	71,	457	Excavation,	5940	20	1188 00	
			Farm bridge,			300 00	
						1488 00	
Amount carried		forward,					98,355 00

	Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregates.*
Amount brought	forward,				1488 00	\$ 98,355 00
From 71 to 72,	93	Embankment,	\$1590	Cts. 25	397 50	
72 73,	193	Do.	2895	20	579 00	
71 73,		Puddling,	2082	40	832 80	
73 76,	303	Excavation of earth,	3030	15	454 50	
76 84,	616	" stony,	8008	25	2002 00	
		Farm-bridge,			300 00	
84 85,	57	Across Pohite Creek Valley, embankment,	2932	25	733 00	
		Puddling,	528	40	211 20	
		Culvert, with waste on the upper side; a little above the mill,			2800 00	
						9,798 00
85 86,	283	The cutting being employed in the embankment,			000 00	
86 87,	60	Embankment,	364	25	91 00	
87 88,	73	Excavation, rocky,	657	30	197 10	
86 88,		Puddling,	611	40	244 40	
						532 50
88 92,	315	Excavation of rock,	8832	40	3532 80	
		Walling,	4876	1 25	6095 00	
		Puddling,	2732	40	1092 80	
92 93,	67	Excavation,	1006	15	150 90	
93 96,	301	" rocky,	3913	30	1173 90	
96 104,	660	" "	16500	35	5775 00	
93 104,		Puddling,	7387	40	2954 80	
						20,775 20
104 105,	42	Across a creek, embankment,	810	25	202 50	
		Puddling,	462	40	184 80	
		Culvert,			960 00	
					1347 30	
Amount carried	forward,					\$ 129,460 70

		Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregates.*
Amount brought		forward,	- - -	-	-	1347 30	$ 129,460 70
From 105 to	113,	440	Excavation, rocky,	15840	Cts. 35	5544 00	
			Puddling,	3520	40	1408 00	
113	114,	53	Across the ravine of a creek, embankment,	11580	25	2895 00	
			Puddling,	583	40	233 20	
			Culvert,			2500 00	
							13,927 50
114	121,	430	Excavation, rocky,	20660	30	6198 00	
			Puddling,	4240	40	1696 00	
121	122,	53	Across a creek, embankment,	4460	25	1115 00	
			Puddling,	530	40	212 00	
			Culvert,			1600 00	
122	125,	230	Excavation,	4140	25	1035 00	
125	126,	78	Do. rocky,	3900	35	1365 00	
126	127,	50	" "	1250	30	375 00	
127	128,	93	" stony,	1116	25	279 00	
122	128,		Puddling,	2634	40	1053 60	
			Waste,			450 00	
							15,378 60
128	131,	330	Excavation, deep,	11220	28	3141 60	
			Puddling,	2310	40	924 00	
131	d,	133	Across Reedy creek, embankment,	36748	25	9187 00	
			(The valley of this creek is crossed at a great elevation,)				
			Puddling,	1463	40	585 20	
			Culvert,			5000 00	
			Farm bridge,			300 00	
d	n,	1155	Excavation, stony,	20592	25	5148 00	
			Waste,			360 00	
						24645 80	
Amount carried		forward,	- - - -	-	-	-	$ 158,766 80

	Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregate.*
Amount brought forward,						$ 158,766 80
From n to 139,	359	Deep cutting,	21900	Cts. 30	$ 24645 80 6570 00	31,215 80
		Farm bridge,			250 00	
139 141,	420	Excavation,	6435	22	1415 70	
141 146,	286	"	2860	20	572 00	
		Farm-bridge,			300 00	
		Road-bridge across the Petersburg turnpike, into which the Coal turnpike must be turned a short distance before the bridge,			480 00	3,017 70
		Station 146 is on the east edge of the Petersburg turnpike, a little above its intersection with the Coal Pits turnpike, and at the corner of the last field-fence of Manchester. This point is the first angle of the basin purposed at that place, the expense of which will be as follows:				
146 147,	397	Embankment,	3074	15	461 10	
147 149,	72	Do.	720	20	144 00	
149 151,	224	Do.	7070	22	1555 40	
151 152,	103	Do.	3504	25	876 00	
152 146,	216	Do. closing the basin,	4320	22	950 40	
		Puddling all around,	2950	40	1180 00	
		For a waste,			450 00	5,616 90
Total amount,						$ 198,617 20
For superintendence, contingencies, &c. add 10 per cent.						19,861 80
Probable cost of the improvement from Bosher's dam to Manchester,						$ 218,479 00

		Distance in yards.		Number of cubic yards.	Price.	Cost.	Aggregates.
Amount brought		forward,	-	-	-	1347 30	$ 129,460 70
From 105 to	113,	440	Excavation, rocky,	15840	Cts. 35	5544 00	
			Puddling,	3520	40	1408 00	
113	114,	53	Across the ravine of a creek, embankment,	11580	25	2895 00	
			Puddling,	583	40	233 20	
			Culvert,			2500 00	
							13,927 50
114	121,	430	Excavation, rocky,	20660	30	6198 00	
			Puddling,	4240	40	1696 00	
121	122,	53	Across a creek, embankment,	4460	25	1115 00	
			Puddling,	530	40	212 00	
			Culvert,			1600 00	
122	125,	230	Excavation,	4140	25	1035 00	
125	126,	78	Do. rocky,	3900	35	1365 00	
126	127,	50	" "	1250	30	375 00	
127	128,	93	" stony,	1116	25	279 00	
122	128,		Puddling,	2634	40	1053 60	
			Waste,			450 00	
							15,378 60
128	131,	330	Excavation, deep,	11220	28	3141 60	
			Puddling,	2310	40	924 00	
131	d,	133	Across Reedy creek, embankment,	36748	25	9187 00	
			(The valley of this creek is crossed at a great elevation,)				
			Puddling,	1463	40	585 20	
			Culvert,			5000 00	
			Farm bridge,			300 00	
d	n,	1155	Excavation, stony,	20592	25	5148 00	
			Waste,			360 00	
						24645 80	
Amount carried		forward,	-	-	-	-	$ 158,766 80

		Distance in yards.		Number of cubic yards.	Price.	Cost.	Aggregates.
Amount brought		forward,		-	-	$ 24645 80	$ 158,766 80
From n to 139,		359	Deep cutting,	21900	Cts. 30	6570 00	
							31,215 80
			Farm-bridge,			250 00	
139	141,	429	Excavation,	6435	22	1415 70	
141	146,	286	"	2860	20	572 00	
			Farm-bridge,			300 00	
			Road-bridge across the Petersburg turnpike, into which the Coal turnpike must be turned a short distance before the bridge,			480 00	
							3,017 70
			Station 146 is on the east edge of the Petersburg turnpike, a little above its intersection with the Coal Pits turnpike, and at the corner of the last field-fence of Manchester. This point is the first angle of the basin purposed at that place, the expense of which will be as follows:				
146	147,	397	Embankment,	3074	15	461 10	
147	149,	72	Do.	720	20	144 00	
149	151,	224	Do.	7070	22	1555 40	
151	152,	103	Do.	3504	25	876 00	
152	146,	216	Do. closing the basin,	4320	22	950 40	
			Puddling all around,	2950	40	1180 00	
			For a waste,			450 00	
							5,616 90
Total amount,				-	-	-	$ 198,617 20
For superintenden		ce, conti	ngencies, &c. add 10 per cent.	-	-	-	19,861 80
Probable cost of		the impr	ovement from Bosher's dam to Manchester,	-	-	-	$ 218,479 00

11.

On Surveys made for the purpose of connecting James River and the Appomattox by a Canal.

Pursuant to the resolution requiring a survey to be made of "the most practicable route for connecting by a navigable canal, the waters of the Appomattox with the south branch of Willis's river, and also with Deep creek and Hudsmouth's creek in Powhatan county, with an estimate of the probable cost thereof," I examined and surveyed, early in the spring, all the practicable routes between the streams therein mentioned. The surveys are contained in three field-books, including one book of sketches of the ground taken at each station. Two maps have been since made from the field notes: one of them relates to the connexion with Willis's river; the other to the routes by Deep creek. The maps and field-books have been deposited in the 2d Auditor's office.

The connexion between the Appomattox and Willis's river.

The operations for the above mentioned object began with the survey between the Appomattox and Willis's river. In a small pamphlet, which was published last winter during the session of the Legislature, an extract was given from a report of the Engineer of the Appomattox Company. It is therein stated that, the level of the lowest point of the ridge between the Appomattox and Willis's river is 117 feet higher than Morton's mill pond, which is situated about two miles above Farmville, and that the fall of the Appomattox from the mouth of Sawney's creek to the same pond is 140 feet; the distance, as the river runs, being nearly 26 miles. The mouth of Sawney's creek, from this statement, would be 23 feet above the dividing ridge. It was accordingly presumed quite practicable to bring the water from that point to the top of the ridge: and, as it appeared possible to give a fall to the feeder, by which the supply would be rendered more brisk, it was supposed that the distance of 26 miles would not be too great, especially as many small streams must be crossed, which might contribute to keep up the supply. In all these conclusions, however, it was admitted that the canal would not exceed much, if at all, the length of the river: this was rendered the more probable that, at many considerable bends of the river, it had been found practicable to save much distance by deep cuts. On the actual length of the feeder, therefore, the practicability of the scheme depended, and I concluded to trace it along the hills.

Previous to this operation, however, I tried the summit of the ridge with the level, and found that the point which had been considered lowest was more elevated above Morton's pond than two other places. The actually lowest point is situated in a field of Chancellor Taylor, behind Lancaster's tavern, at the head of the ravine which leads to Allen's mill on Willis's river: it is 111 feet above Morton's pond; this point is marked *Station* 1*st* on the map. The point whose height had been previously ascertained is on the road half a mile below Lancaster's tavern, and marked A on the map. The third point is situated near Ranson's, two miles below Lancaster's tavern, and also on the road; its elevation above Morton's pond is 112 feet; it is designated on the map by the letter *C*.

After these preliminary measurements, I proceeded to trace the feeder along the hills. The country is excessively broken; the line of the feeder must head numerous ravines and pass round a great many long spurs, whereby its extent is considerably increased; at the valley of Watt's creek the level was found to be 90 feet above the creek which is very sluggish; so that to head it, as well as all the ravines that make into it, a distance of probably ten miles would have been lost. Crossing, therefore, at once this valley which is 500 yards wide, the windings of the level were pursued beyond it as far as Ducker's creek, where the difficulty presented being fully as great as at Watt's creek, it was deemed quite impracticable to obtain a supply of water from the point and at the elevation contemplated; and it appeared indispensable to adopt a low level that would pass near the base of the hills, and thereby avoid the elongation produced by winding round deep ravines and long spurs, as well as the expense of deep cuts and high embankments. The level which appeared most eligible is that of Allen's mill pond on the South branch of Willis's river, because on this level the canal might be fed both from the Appomattox and Willis's river; which would, not only insure a better supply, but also reduce the quantity drawn off from the Appomattox to a very inconsiderable contribution.

The level of Allen's pond is 31 feet above Morton's pond and 80 feet below the top of the nearest low place of the dividing ridge, and consequently 81 feet below the low place by Ranson's: So low a level, it is obvious, would require a tunnel through the hill and some deep cutting on either side. But on this subject, it may be remarked that tunnels are frequently very erroneously objected to, or, when found indispensable, generally located as high, and consequently made as short, as possible; whereas, on the contrary, when notof an inconvenient length, they most commonly prove more economical and otherwise advantageous than an open but higher level; and many canals are ill supplied with water, because of their feeder having been placed high in order to shorten or entirely avoid tunnels. The lowering of a feeder will of course lengthen a tunnel, but on the other hand, it will save a double lockage, whose expense and inconvenience greatly exceed, in general, the corresponding circumstances resulting from the extension of the tunnel. Through a hill sloping at 20 degrees, for instance, which is a very common case, a tunnel lowered 68 feet would save 136 feet of lockage and would be only 125 yards longer; the expense and inconvenience produced by which bear no proportion to either the expense or inconvenience resulting from so much lockage.

The shortest tunnel at the upper point would be 5440 feet in length, owing to the flatness of the hill at top: the tunnel at the low place by Ranson's would be 4000 feet. The quantity of deep cutting at the latter place would also be less than at the former: these facts recommend the route by Ranson's.

The most expedient plan to effect the proposed communication would, therefore, be, to make a tunnel of 4000 feet in length through the hill at Ranson's; the tunnel to begin after the cutting should have attained the depth of 38 feet. At its southern end the tunnel would open into the valley of Dry creek, there the length of the deep cutting would be 1533 yards; at its northern extremity it would communicate with the valley of Bear branch along which the extent of the deep cutting would be 1653 yards: in both cases the slope is concave and consequently the depth of cutting increases less rapidly, than it would on a regular slope rising 38 feet from one extremity to the other. The two feeders to bring the water to the tunnel would be as follow: From Allen's mill to the beginning of the deep cutting it is 3½ miles, the two first of which are along the southern bank of Willis's river; the remainder is up the valley of Bear branch. The level of the south branch of Willis's river at the mouth of Bear branch is 33 feet below Allen's pond: four locks at this place would let the boats from the canal down into the south branch of Willis's river. Thence to its fork with the North branch, it may be improved upon the plan of dams and gates, which has been in operation for many years on the other part of the river.

On the Appomattox side, the feeder must begin about one and a half mile above Watt's creek, at a bluff of rocks where there is a good site for a dam, which must be made 14¼ feet high, in order to allow of a fall of four inches per mile of the feeder. The length of this feeder, to the point where it leaves the margin of the Appomattox, is 6½ miles; it crosses, in this distance, the vallies of Watt's creek and Pennick's branch by long embankments, but on a low level. The feeder would leave the Appomattox near the mouth of Dry creek, in sight of Morton's pond, and, pursuing the windings of the spurs and hollows along and up the valley of the creek for 3½ miles, it would reach the deep cut which precedes the tunnel. At the turn which is taken from the Appomattox up Dry creek, four locks would be requisite, by which boats would drop 31 feet into Morton's pond, and thence pass through the lock in Morton's dam into the bed of the Appomattox.

The length of the feeder from the Appomattox would, therefore, be 10 miles; the deep cuttings and tunnel 4,520 yards, or a little upwards of 2½ miles, and the feeder from the south branch of Willis's river 3½ miles; making in all 16 miles of canal. The descents, by locks on both sides, would occupy, together, an additional length of about one mile, and require 64 feet of lockage. The ground along the route of the feeders, is variable and occasionally rocky: the tunnel and deep cuts would probably pass mostly through rock.

The connexion between the Appomattox and Deep creek.

Several passes were examined and levelled between the Appomattox and the head of Hudsmouth's creek: the shortest and best is across from the head of the valley, just below Doctor William Crump's house, to the head of Sallee's creek, (the same as Hudsmouth's creek:) the top of the ridge there, is 130 feet above the Appomattox. The ground being even more broken than on the communication by way of Willis's river, and the Appomattox being much more sluggish, precluded the thought of attempting to bring a feeder to the top of the ridge, which is besides so narrow, that a tunnel through it would, at all events, be the cheapest plan. It is, in general, only under very favourable circumstances, that a feeder can be kept on a high level; the necessity of turning round spurs and heading vallies, will most commonly increase the distance and exhaust the supply, unless expensive deep cuts and tunnels be resorted to through spurs; and high embankments or aqueducts thrown across ravines.

After having ascertained the nearest way across the ridge, a level 32 feet above the bed of the Appomattox was assumed, as best suited to the ground. This level requires a tunnel of 911 yards in length to be opened through the hill; and also an extent of deep cutting of 1192 yards in length towards the Appomattox, and 1612 yards on the side of Sallee's creek; but the depth of cutting increases very little at the beginning, and becomes considerable, on either side, only where it approaches very near to the tunnel.

The feeder would be very nearly twelve miles in length; its beginning being about a mile below Little Guinea creek, and the water introduced into it by a dam of 9 feet lift, built at a favorable site in the pond formed by the dam at Clemmentown, and a very short distance below the head of it. At the point where the route of the feeder leaves the Appomattox to take up the valley leading to the tunnel, four locks should be made to drop 32 feet into the bed of the Appomattox.

From the extremity of the deep cutting on the other side, to the point where Deep creek is entered into, the canal would follow the bed of Sallee's creek, (Hudsmouth's.) The distance is four miles, and the fall 72½ feet. Deep creek is there 30 feet wide; for the remaining distance to James river, which is only about one and a half mile, the creek is susceptible of being improved on the plan of Willis's river. The whole length of canal, including deep cuts and tunnel, is very nearly 19 miles. The map exhibits all the operations on this route.

The examination of two passes, between the head of Deep creek and the Appomattox, produced the following conclusions: The shortest tunnel at that place, would be 883 yards in length; that is to say, 28 yards shorter than on the Sallee's creek route; but the deep cutting would be more considerable, and a great part of it through a sandy soil, which would probably not stand. The expense of both the deep cutting and tunnel here, would exceed a little the same items on the route by Dr. Crump's. The continuation of the canal down Little Deep creek, besides, would be through a very porous sandy soil, and the route would add 29 feet to the lockage; in addition to which, much difficulty would be encountered in bringing the feeder, from a higher point of the Appomattox, down to this pass; the ground for this feeder being generally bad, and the wide vallies of the two Guinea creeks, having to be crossed, near the lower end of the feeder, at consequently a considerable elevation. In all these particulars, and also because a point lower down the stream is generally more favourable to the object of such a scheme, the route by Dr. William Crump's appears preferable.

On this route, the ground for the feeder along the Appomattox is better; the descent towards James river, in the valley of Sallee's creek, is mostly through tough clay, very favorable to canalling; the deep cutting would be partially through good ground and partially through rock; the tunnel would, to all appearances, pass through fine granite the whole way: this circumstance is very much in favour of the route, as the tunnel would most probably not require arching; an operation which, when necessary, swells considerably the expense of these subterraneous works.

In regard to the relative merits of the communication in Powhatan by Hudsmouth's, otherwise Sallee's creek, and that in Cumberland by Willis's river, I think that the lower route possesses decided advantages. It is evident that the lower down the Appomattox and James river a connexion is effected from one to the other, the more beneficial it must be; since it embraces above it a greater extent of country, and saves both upstream navigation and distance in the transportation of produce from the lower section of the country interested in the communication. To this general consideration it may be added, that in the present case, the distance from one river to the other is much shorter at the lower point than by Willis's river.

It is only a remarkable superiority in point of practicability and expense, that could determine a choice of the upper route; but in this likewise it yields to the lower one, for it would require a tunnel 422 yards longer and also a greater quantity of deep cutting: and the ground being generally worse both along the line of the feeder and at the tunnel, the expense would undoubtedly be greater on the upper than on the lower route, though the length of the canal would be somewhat shorter and the lockage less. The only advantage of the route by Willis's river is the possibility of feeding the canal from both sides, whereby the draught of water out of the Appomattox would be reduced to an unimportant supply. Deep creek, on the contrary, lies so much below the Appomattox at the point of connexion that, to bring a supply from it into the canal would be attended with great difficulty and expense, as it would have to be taken out of Deep creek a considerable distance above, and carried along the hills at a great elevation.

The probable cost of the lower communication would be, as shewn by the subjoined estimate, $258,800, the connexion between the Appomattox and James river may be considered as a continuation of the line of improvement from the Roanoke to the Appomattox; as such, it is of the highest importance, the Richmond market being now sought from the Appomattox at great expense. The trade of the Roanoke and Appomattox united, flowing through this new channel, would undoubtedly amply repay the cost of the undertaking, and add besides considerably to the amount of tolls received on the James river canal. On this last account, even the trade of the Appomattox alone would be sufficient, I think, to pay to the State a competent interest on two-fifths of the estimated expenditure: for, from the information I have collected, it appears that, of tobacco alone no less than four thousand hogsheads might be expected to come every year to Richmond from that district; the tolls of these on the James river Canal would produce $4,000 over and above the tolls collected on the canal between the Appomattox and James river, which, considering the expensiveness of the present means of transportation, might be raised to a pretty high rate, and still leave a sufficient benefit upon the article to induce a preference of the route.

AN ABSTRACT

Of the estimate of a canal to unite the Appomattox and James river by the valley of Hudsmouth's (Sallee's) Creek.

	Distance in yards.		*Number of cubic yards.*	*Price.*	*Cost.*	*Aggregates.*
		For a dam 11 feet high 80 feet long,			$1200 00	
		Double guard gates,			1500 00	
From the entrance to station 89,	710	Excavation,	8165	Cts. 14	1143 10	
From 89 to *u*,	606	"	5455	12	654 60	
u 88,	130	"	2600	16	416 00	
88 87,	726	"	8350	15	1252 50	
87 78,	3091	"	27820	12	3338 40	
78 76,	196	Excavation, rocky,	2548	30	764 40	
		Puddling,	1176	40	470 40	
76 71,	1906	Excavation, good,	18100	12	2172 00	
71 70,	220	Across Bent creek embankment puddle, culvert,			1295 00	
						$14,206 40
70 67,	549	Excavation,	6590	12	790 80	
		Additional for waste, &c.			310 00	
67 65,	284	Excavation,	5200	18	936 00	
70 65,		Additional for puddling,	2500	25	625 00	
65 63,	472	Embankment,	4048	20	809 60	
		Excavation,	3740	15	561 00	
		Waste,			320 00	
63 61,	456	Excavation,	5245	12	629 40	
61 60,	90	"	910	16	145 60	
					5127 40	
Amount carried	forward,	- - - -	-	-	- -	14,206 40

		Distance in yards		Number of cubic yards.	Price.	Cost.	Aggregates.
Amount brought		forward.	- - - -	-	-	$5127 40	$14,206 40
From 60 to	49,	2238	Excavation,	21261	Cts 10	2126 10	
49	48,	140	Embankment, culvert and puddling,			2130 00	
48	43,	713	Excavation,	6516	10	651 60	
43	38,	856	"	5945	12	713 40	
			Embankment across Swan's Creek Valley,	17000	20	340 00	
			Puddling, (additional,)	2000	20	400 00	
			Culvert,			1000 00	15,548 50
38	9,	827	Excavation,	10795	12	1295 40	
			Embankment,	1000	20	200 00	
9	34,	130	Wall and embankment,			505 00	
34	27,	1106	Excavation,	12865	12	1543 80	
			Embankment,	880	20	176 00	
			Wall,			125 00	3,845 20
27	23,	1100	Excavation,	12100	15	1815 00	
			Embankment and waste,			400 00	
23	17,	1435	Excavation,	13120	10	1312 00	
17	16,	246	Across Horse Pen Branch Valley, high embankment,	13837	20	2767 40	
			Puddling,	2460	40	984 00	
			Culvert,			900 00	
16	7,	1570	Excavation,	14350	12	1722 00	9,900 40
7	6,	163	Across the valley, just above Dr. Wm. Crump's; embankment,	18400	20	3680 00	
			Puddling,	1630	40	652 00	
			Culvert,			900 00	
			This and the preceding valley, are too flat to be overflowed by an embankment,			5232 00	
Amount carried		forward,	- - - -	-	-	-	43,500 50

	Distance in yards.		Number of cubic yards.	Price.	Cost.	Aggregates.
Amount brought	forward,	- - - -	-	-	$5232 00	$ 43,500 50
From 6 to 22,	1290	Excavation,	12900	Cts. 12	1548 00	
		Culvert,			550 00	
						7,330 00
22 27,	1192	Deep cutting from 3½ to 40 feet in depth on the Appomattox side, earth,	16690	15	2503 50	
		Rock,	26110	1 00	26110 00	
						28,613 50
27 42,	911	Tunnel,		55 00 per yard running, or 2 20 per cubic yard.	50105 00	
		5 shafts averaging 22 yards in height,	550	2 20	1210 00	
						51,315 00
42 45,	1612	Deep cutting on the side of Sallee's creek from 3½ to 40 feet in depth—earth,	9758	15	1463 70	
		" "	2130	16	340 80	
		" "	1760	17	299 20	
		" "	2640	18	475 20	
		" "	14820	19	2815 80	
		" Rock,	28588	1 00	28588 00	
From 54 to the fork of Sallee's & Deep creeks,	9000	Down the valley of Sallee's creek remarkably good ground, excavation,	68160	12		8,179 20
Amount carried	forward,	- - - -	-	-	-	172,920 90

Amount brought forward,	-	-	$ 172,920 90
Lockage down to the Appomattox,	32 feet,	$ 700 00	22,400 00
Lockage down Sallee's creek, -	72½ "	500 00	36,250 00
15 farm bridges, -	-	-	3,750 00
Total amount, -	-	-	$ 235,320 90
For superintendence, contingencies, &c.		-	23,532 10
Total cost of the improvement,		-	258,853 00

C. CROZET, *P. E.*

29th March, 1826.

12.

On the surveys made in the North-Western district of the State, with a view to the location of several roads.

By a resolution of the 11th of January, 1823, the location of a road was directed to be made from the Yohoghany bridge, by way of Morgantown, to some point on the Ohio river, between the mouth of Fishing creek and Marietta.

A subsequent resolution of the 4th of February of the same year, directed a like operation from Winchester to Romney, and from Winchester to Frankfort.

A third resolution of the 15th of February, also of the same year, required the Principal Engineer to mark and lay out a road from Romney to Clarksburg, and from thence to the nearest practicable point on the Ohio.

The intention of these resolutions being obviously the improvement of the same section of the State, it appeared to me that there might be some propriety in conducting these duties together. The season favorable to field-operations was employed in making, between all the points designated in the resolutions, the preliminary surveys preparatory to the locations; the platting and mapping of these surveys was reserved for the winter season: by this arrangement, the field work has been much advanced; the maps are now all completed. With the assistance of all this preliminary work, and the knowledge I have obtained of the country through which the surveys were made, I am prepared to locate any section of the contemplated roads, whenever I receive orders to that effect.

On the several routes surveyed, I beg to offer the following observations, and respectfully request to receive farther instructions as to the prosecution of these operations.*

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* The surveys are comprised in seven field-books and five maps, which have been deposited in the Second Auditor's office, viz: One map and one book, from Winchester to Romney; one map and three books, from Romney to Clarksburg; two maps and two books, from Clarksburg to the Ohio, and from the Ohio to Morgantown; one map and one book, from Morgantown to Smythfield. The maps and field-books are made exactly on the same plan as described in my report on the surveys from Staunton to Callaghan's.

1. *The roads from Winchester to Romney, and from Winchester to Frankfort.*

The survey between these places, was made in 1823, though not then in order; but, one of my assistants being at that time unemployed, I directed him to obtain this survey, while I was engaged in the neighbourhood in examining some of the water courses.

The shortest existing road between Winchester and Romney, was surveyed, and it was found, as exhibited on the map, that the magnetic course between these places, is S. 71¾ E.; the straight distance 32.76 miles, and the distance by the road, 41.86 miles. The number of steep mountains which intervene, is the cause of the loss of distance being so considerable; the road is, nevertheless, susceptible of being shortened and improved; the nature of the ground is generally favorable. From Winchester to the main Sandy Knob which divides the Cacapehon and the North river, the present road winds considerably, and lies north of the straight course; from the Sandy Knob it keeps to the south of the direct line, from which it is no where very distant. The ridges traversed by it are so numerous, that it is only by the map that a clear description of them can be conveyed. There are now three roads travelled between Winchester and Romney; a circumstance, which, while it indicates a considerable intercourse between the two places, is also the cause of a division of interest and labor, injurious to the communication: it would, therefore, be highly advantageous to open a well located road between the two aforesaid towns. The new route would not vary much from that surveyed; I shall consider it farther, in connection with the roads to Clarksburg and the Ohio.

Instead of surveying from Winchester directly to Frankfort, it was deemed more expeditious to obtain the course and distance between them, by continuing the survey from Romney to Frankfort. The course was thus ascertained to be N. 56¼ W. and the straight distance 38.55 miles.

The course from Romney to Frankfort is N. 5 W.; the straight distance 11.04 miles, and by the road 15.22.

It will be remarked on the map, that the section of the road from Winchester to the North mountain, may be common to the roads leading to Romney and to Frankfort; and also, that, at the other end, the section between Frankfort and Springfield, may likewise be common to the road from Frankfort to Winchester, and to Romney.

2. *The road from Romney to Clarksburg.*

From the survey made between these two places, it results, that the course from Romney to Clarksburg, is S. 85° 50′ W.; the straight distance 84 miles, and by the shortest existing road 107 miles, shewing a loss of distance of 23 miles. The route of the road must, necessarily, traverse several almost parallel ridges. The present road passes through a level gap of the South Branch mountain; it then takes over Middle ridge, and next crosses Patterson's creek at Burlington, three miles beyond which, it deviates considerably from the straight course it had kept to that point. The deviation is occasioned by the crossing of Knobly and New Creek mountains through favorable gaps. Other openings, however, which are more in course, were observed in these ridges.

Next in order, comes the Alleghany mountain, which is crossed exactly on the straight line: thence the road inclines to the south, and crosses successively Abraham's creek, Stony river, Difficult run, and the North branch of the Potomac. From this river, and for nearly 8¾ miles, the road surveyed passes through the State of Maryland, within which it crosses the great Back-bone. It re-enters Virginia very nearly on the straight course, at the Germany settlements, from which, to Cheat river, it is very winding, but meets no considerable mountain. A little beyond Cheat river, it passes over Laurel hill, which is the last considerable ridge to be overcome. A short distance on this side of Tygart's Valley river, this road crosses again the straight line, and passes to the south of it. The last named river is crossed at M'Daniel's ferry: thence to Clarksburg, the road keeps mostly along Simpson's creek, which it crosses at Bridgeport, and lastly, just at Clarksburg, it crosses Elk run.

From the foregoing account, it will appear, that from Romney, for about 13½ miles, the present road follows the nearest track, and will only require to be improved in places.

From the end of these 13½ miles, to the crossing of the North branch of the Potomac, a new location is indispensable;

but yet the Alleghany mountain must be passed over nearly at the same place. Although the crossing of the North branch is too much to the south, still I think that it must be considered as a necessary point of the road, on account of its entering Maryland there. The necessity of passing through this State would be an objection, if the distance across it was not so small, or the road was bad; but, on the contrary, these few miles are the best part of the whole road.

From the Maryland line to the crossing of Cheat river, the location must be altered. Beyond Laurel hill, and as far as Bridgeport, the road keeps so near the course, that no great advantage could be obtained by a total change of the general location, though much may be done to improve it.

Between Bridgeport and Clarksburg, the distance by the present road is 6¼ miles. The road being very circuitous, a new road was located, which will save 1½ mile in that short distance. I have understood since, that this new track had been opened: it is indicated on the map by a black line, which keeps all the way along the straight line from Clarksburg to Romney. It is the only part which time would allow me to locate, my attendance being then required on the Kanawha road and river.

The road usually travelled between Romney and Clarksburg, is very circuitous: it passes by Kingwood, and traverses, for a distance of upwards of thirty miles, the State of Maryland, through which there is much very rough ground. The road enters again the State of Virginia near Paddy Town. From its being preferred, though so circuitous, it might be supposed that it passes over comparatively good ground; but I am convinced, that the circumstances which caused it to be sooner opened for waggons, were merely accidental, and that on the direct course, a better road may be made, than will ever be allowed by the ground which the Kingwood road passes over: so that the new road, when opened, will combine the advantages of ground and distance, and also reduce the section through Maryland, to only 8¾ miles.

3. *The road from Clarksburg to the Ohio.*

The nearest point on the Ohio river being Sistersville, the shortest path leading to it was surveyed. From this operation it appears that the course from Clarksburg to Sistersville is N. 63 W. and the straight distance 40 miles: the path surveyed makes the distance 54.20 miles. This survey, however, being merely a first attempt through an unexplored country, it must be expected that the road, when located, will be much shorter. The only mountain of any importance that must be passed over, is the dividing ridge between the waters of Monongalia and Ohio. The most favorable pass through this ridge is at Elk-horn Gap, which is not far from the straight line.

Although, pursuant to the resolution, the survey was made to the nearest point on the Ohio, and a road from Sistersville to Clarksburg would be a great advantage to that district; still it appears to me that, if this road went to Parkersburg and Marietta, it would be attended with greater public benefit. The favorable situation of Marietta at the mouth of the Muskingum, and its being, I was told, frequently the head of steamboat navigation, make it an important point; and the improvements going on in the State of Ohio, will certainly add greatly to its prosperity. It is, therefore, presumable, that a good road leading from this point towards Washington City, would become an important thoroughfare; and, that instead of ascending the Ohio as high up as Wheeling, thereat to take the national turnpike, the travelling and trade from the western States would prefer this shorter direction. From Washington City to Wheeling the distance is 268 miles; from thence to Parkersburg it is about 100 miles by water; whereas the distance by the contemplated route from Parkersburg to Washington would probably not exceed 280 miles.

This new road would, besides, procure to an extensive and very fertile district of this State, the advantages of a convenient market, of which it is now almost entirely deprived, and soon place it in as flourishing a condition as the sections of Pennsylvania and Maryland, whose prosperity was produced by the national turnpike: so that, whether as a means of improving the north-western part of the State, or as a more direct communication with the western States, it is almost beyond a doubt, that this road would prove a profitable source of revenue, and otherwise a very beneficial improvement to the State.

From Winchester to Romney, the present intercourse would require a road 18 feet wide; which, exclusive of bridges, might be made at an average cost of $500 a mile, or about $20,000 for the whole distance. A road of a width of 18 feet, exclusive of ditches, and thrown up only 9 inches in the middle, through level ground, but made flat along declivities, will be found wide enough for two waggons: as to the other particulars of its construction, I beg to refer to some suggestions contained in my report of this year on the Kanawha road.

From Romney to Marietta and Parkersburg, I would suggest to make the road only 12 feet wide. Such a road could be made in that country for $270 a mile, exclusive of bridges, or about $27,000 from Romney to Clarksburg, and $19,000 from Clarksburg to Marietta or Parkersburg: a road of this width, if judiciously located, will answer every useful purpose at first; the existing roads in that section of the State are seldom wider. When the increase of the trade and the travelling shall produce some inconvenience on so narrow a road, it may be easily widened; for, the making of a road differs from a canal in this respect, that, when once made, the canal cannot be widened without swelling considerably its ultimate cost beyond what it would otherwise have been if properly made at first; whereas the widening of a road does not produce in the end a greater aggregate of expense, than that which would have constructed it at once of the width finally obtained. Whenever an improvement is thus susceptible of progressing by gradual steps, it appears highly expedient and advantageous to begin it on a small scale, through a country, particularly, where the means of perfecting the improvement do not exist at first, but are expected to grow out of the benefits of the improvement itself: this I conceive to be the most economical and efficient mode of applying funds to such purposes. Moreover, in order to derive as soon as possible some benefit from the road in contemplation, I should think it advisable to begin with the most difficult section of it, which extends from Patterson's creek to the western base of the Laurel-hill, and includes the Alleghany mountain.

As to the bridges to be made over the several streams crossed by the road, the erection of most of them might be deferred upon the same principles and with the same view as above-mentioned of reducing the first cost of the undertaking in order to facilitate it.

The road from Smythfield, (Pennsylvania,) to Morgantown.

This road begins in Pennsylvania and crosses a corner of Maryland; it enters Virginia at a distance of 11 miles from the Yohoghany bridge, which is at Smythfield. This section out of the State, is a good road; nearly two miles of it are on the national turnpike, and the rest hardly calls for improvement: so that its passing through other States, will not be an objection to the contemplated road from Smythfield to Morgantown.

From the Virginia line to Morgantown, the distance along the present road is 25 miles; it passes over Laurel-hill, near the western base of which it crosses Cheat river: these are the two principal difficulties in the way. The present location through Virginia must be entirely changed. There is to the south of the existing road a valley, which, almost from Morgantown, leads down to Cheat river; on the other side of this stream another valley rises gradually up to the top of the Laurel-hill. These two vallies would be a more favorable route than the present one.

The course from Smythfield to Morgantown is S. 72½ W.; the straight distance 30.64 miles, and the distance by the road 36.36 miles. The road from Smythfield to the Laurel-hill keeps considerably to the south of the straight line; it crosses it at the Laurel-hill, and thence to Morgantown proceeds somewhat on the north side of it. The ground is generally as good as can be expected in a mountainous country. The place where Laurel-hill is crossed is very favorable and much better than that where the national turnpike passes over it.

The road from Morgantown to the Ohio.

The point on the Ohio at which this road must terminate not being designated by law, but merely required to be between Marietta and the mouth of Fishing creek, a survey was made along the Ohio, from which it appeared that no intermediate point would be so advantageous as either of the extreme ones. The mouth of Fishing creek being nighest to Morgantown, the shortest path now leading to it was surveyed.

This operation shews that the course between the two places is S. 88°-31′ W. the straight distance 47.85 miles, and the path surveyed 61.39 miles. The survey was conducted along a mere path, and consequently many considerable windings were made; it is probable, therefore, that a well located road would be much shorter than the path surveyed and might not exceed 56 miles. The map prepared from the field-notes explains better than could be done by words, the relative situation of all the points of the route run.

A glance at the map of Virginia will shew that the distance from Smythfield to the mouth of Fishing creek is about equal to the distance from the same town to Wheeling: hence a road to the mouth of Fishing creek would save to travellers the whole distance from Fishing creek to Wheeling, which is about 40 miles. The contemplated road would pass over better ground than the national turnpike; it is, therefore, certain that, if well located, it would be taken in preference, especially during the summer, when the latter is unpleasant to travel.

The section from Morgantown to Smythfield particularly, would be considerably travelled to get to the national turnpike from all the adjacent country and especially from Clarksburg.

The mouth of Fishing creek seems to be preferable to Marietta as the extreme point of this road on several accounts. Not only it is nearer to Morgantown, but even the distance from this last place to Marietta by way of Fishing creek exceeds but very little the direct road, and consequently travellers would generally prefer to continue by water from Marietta as far as the mouth of Fishing creek and there to take the short road to Smythfield.

If, however, in connexion with the road from Marietta to Clarksburg, the present road from the latter place to Morgantown was improved, a very useful communication would be made between Smythfield, Morgantown, Clarksburg and Marietta or Parkersburg: and indeed, the road from Morgantown to Clarksburg would be more easily constructed than that to Fishing creek; for, not only it would hardly exceed 35 miles, (whereas the route to the mouth of Fishing creek could not be made in less than 56 miles;) but also, as this improvement would only require to meliorate a waggon road already much used between Clarksburg and Morgantown, and which passes through a well settled country, it is probable that subscriptions could be obtained more readily upon it than between Morgantown and the mouth of Fishing creek. Consequently in regard to the facility of opening it, that route may be said to be more eligible; but, as a communication with the State of Ohio, the road by Fishing creek, when made, will certainly have superior advantages; for travellers will generally choose to go by water as high up as they can without losing distance.

For the same reasons as were developed in speaking of the road from Parkersburg or Marietta to Romney, I think that it would be expedient to make the road from the mouth of Fishing creek to Morgantown only 12 feet wide at first: the road might then probably be made for $16,000; but from Morgantown to the Virginia line, it ought to be made 18 feet wide in the clear: this distance which is, as stated above, about

25 miles, might probably cost $14,000 exclusive of bridges, which need not be constructed at the first opening of the road: so that the whole communication might be made a good road for $30,000.

All which is respectfully submitted.

C. CROZET, *P. E.*

29th March, 1826.

NOTE—Reports No. 10, 11 and 12, were transmitted by the Principal Engineer after the rising of the General Assembly.

DUTIES OF THE PRINCIPAL ENGINEER,

FOR THE YEAR 1825.

(*Adopted by the Board of Public Works, 8th Feb.* 1825.)

The committee appointed to prescribe the duties of the Principal Engineer, during the present year, report: That but few of the duties required, were performed within the last year, in consequence of the resolution of the members ex-officio of the 20th March last.

Your committee, therefore, recommend that the Principal Engineer, in conjunction with the Assistant Engineer and Commissioners appointed under the fourth section of the act of Assembly of the 8th March last, proceed, as early as may be practicable, to discharge the duties therein prescribed; and that during the time he shall not be so employed, he shall make the surveys and examinations required by the report of 4th February, 1823, and by subsequent resolutions adopted by the Board the 7th February and the 9th April, 1823, as also by the report of the 2d February last, which have not yet been executed, in the order therein prescribed.

Resolved, That the Principal Engineer survey and mark a way for a road, by the shortest practicable route, from the north end of the bridge across Dan river at Danville, in the county of Pittsylvania, to Wythe courthouse, as soon as existing engagements may permit.

Resolved, That all resolutions of the General Assembly instructing the Engineer, through this Board, to make surveys of roads and rivers, which may be passed at the present session of the Legislature, and after the adjournment of this Board, be laid before the members ex-officio, by the Secretary.

◆

Adopted 16*th March,* 1825,

BY THE EX-OFFICIO MEMBERS.

Resolved, That it is deemed expedient, that the Principal Engineer, during the present year, survey

The most practicable route for connecting, by a navigable canal, the waters of the Appomattox with the south branch of Willis's river, and also with Deep creek and Hudson's creek in

Powhatan county, with an estimate of the probable cost thereof; and

The most practicable and advantageous route for a canal on the south side of James river, from some point above and near Bosher's dam to Manchester, with the probable cost of such improvement, &c.

As directed by resolutions of the General Assembly, of the 8th and 14th February last.

DUTIES OF THE PRINCIPAL ENGINEER,

FOR THE YEAR 1826.

(*Adopted by the Board of Public Works, 24th Jan.* 1826.)

The committee appointed to prescribe the duties of the Principal Engineer, during the present year, report: That the services prescribed to him on James river being pretermitted by authority of the General Assembly, much of the residue which was assigned to him for the last year, has been executed; but there are yet many surveys and examinations directed by the Legislature, within the last two years, to which his attention should be turned, and as far as practicable, executed during the present. Your committee, therefore, recommend that he

Survey Harrison's bar, in James river:

Survey and examine Mattapony river, from Aylett's to the highest point to which boat navigation may be attained:

Survey the Meherrin river, from Murfreesborough to the highest navigable point on said river:

Survey and examine Nottoway river, from the mouth to the highest navigable point on said river:

Make a correct survey of the country lying between the head waters of Nansemond river, Black-Water river, and Somerton creek, in order to connect the two rivers by a canal, with an estimate of the expense of such canal.

Survey, examine and report, the most expedient method of improving the Rivanna river:

Make a survey and estimate of the improvement for the Junction canal:

Survey the shortest practicable route from the north end of the bridge at Danville, in Pittsylvania county, to Wythe courthouse:

Survey a route for a road from the falls of the Great Kanawha river, to Point Pleasant on the north-east side of said river:

Mark the best site for a bridge over Cheat and Valley rivers, at or near where the State road crosses them:

Attend the Commissioner of the Kanawha road and river, at such time as his services may be required by the said Commissioner:

And that he report to this Board, at its next annual meeting, his progress in the execution of the aforesaid duties.

Resolved, That the Principal Engineer attend to the services recommended in the foregoing report, in the order in which they are prescribed.

Resolved, That if the Principal Engineer shall have any leisure from the duties here prescribed, he shall examine and report upon the works done, or in progress by, any companies connected with this Board.

Adopted 14*th April*, 1826,

BY THE EX-OFFICIO MEMBERS.

Resolved, That the Civil Engineer, in conformity to the directions of an act of Assembly, passed the 1st March last, entitled, "an act incorporating a company to establish a turnpike road from Covington to Lynchburg, and for other purposes," proceed, as soon as existing engagements will permit, to make a survey, and report upon the advantages of the aforesaid road; and also, of the shortest and best practicable route for a road from Covington to the city of Richmond.

Resolved, That the Principal Engineer, as soon as pre-existing engagements will permit, locate the road from Staunton to Riffle's run in the county of Randolph, which was surveyed by him in 1823, but not marked out.

Truly copied. J. BROWN, Jr.
2d Auditor.

DOCUMENTS

COMMUNICATED TO THE LEGISLATURE,

RELATIVE TO

INTERNAL IMPROVEMENT.

REPORT

OF THE

Commissioner of the James and Jackson's river Canal.

TO THE GENERAL ASSEMBLY OF VIRGINIA.

The Commissioner and Engineer of the James and Jackson's river canal, respectfully REPORTS:

That the canal from the city of Richmond to the Maiden's Adventure Falls, is so far completed as to admit of being in full operation throughout its whole extent. Its banks, however, in a number of places, have become so much depressed by settling, and abraded by showers of rain, as to require considerable labour and expense in repairing them. There are also several contracts for fencing upon the towing-path, which are in progress of execution and not yet completed; and one farm-bridge, to be built for Mr. Richard Sampson's accommodation, which has been lately awarded to him by the Superior Court of Law for Goochland county.

This improvement, in addition to a very large proportion of heavy stone walling, comprises the following works of art: Upon the first level, extending the distance of three miles and twenty chains, from the basin in Richmond, there are three waste weirs, two culverts, one set of flood gates, one farm-bridge, two foot-bridges, one guard-gate, and a dam across the river. Upon the second level, extending the distance of two miles and twenty chains, there are two lift-locks, two wastes, one guard-lock, three farm-bridges, one guard-gate, and a dam across an arm of the river. Upon the third level, extending the distance of nine and a half miles, to the western mouth of Tuckahoe creek, there are three lift-locks, two guard-locks, one guard-gate, two wastes, two culverts, nine farm-bridges, and a dam across the river. Upon the fourth level, extending the distance of five and a half miles, there are three lift-locks, one aqueduct, two culverts, three wastes, one road bridge, and six farm-bridges. Upon the fifth level, extending the distance of ten miles, to the Maiden's Adventure Falls, there are two guard-locks, two lift-locks, four aqueducts, three culverts, five wastes, one road-bridge, fifteen farm-bridges, and a dam across the river; making in all, four dams across the river, ten lift-locks, including those in the dams, five guard-locks, three guard-gates, five aqueducts, nine culverts, fifteen waste weirs, one set of flood-gates, exclusive of those in several of the waste weirs, two foot-bridges, two road-bridges, and thirty-four farm-bridges. To which may be added, fencing upon the greater part of the line, tow-bridges over all the wastes, and hand-railing upon several of the stone walls.

A freshet in the river which happened in January last, after the former Commissioner had made his report, occasioned considerable injury to the works. Two high walls were thrown down, with their embankments, and a waste weir attached to one of them; one of the chamber-walls of the guard-lock in Mr. Wickham's farm, (with the embankment which it supported,) was prostrated, and the canal filled two feet deep with the ruins, for a considerable distance below it. The embankment about a pair of flood-gates, which had been constructed in the lower mouth of Tuckahœ Creek, was swept away, and the canal much filled in at several other places. These injuries, together with a breach in the old canal, which took place about the same time, two other breaches upon the second level, which happened during the summer, several additional farm-bridges, and some extra damages, obtained by legal process, have produced an accession to the expense of the work, beyond what was foreseen and estimated.

The improvement for passing Beaver-dam Creek, which had been devised, and contracted for by the former engineer, to consist of two guard-gates placed sixty feet apart, and connected by a waste dam, over which, and between the gates, the creek was intended to pass in times of high water, and to be received into the canal at all other times, was deemed very objectionable in many respects, and of course rejected. In lieu of it, an aqueduct one hundred feet in length, has been thrown across the creek and connected with a guard-lock, for the protection of the canal below. In this aqueduct, two cast-iron culverts are inserted, for the passage of the Creek water at its ordinary height; but, when it rises considerably, the aqueduct will be inundated without injury to the canal, or impediment to its navigation.

For the flood-gates which had been constructed in the lower mouth of Tuckahœ Creek, (and found not to answer the purpose for which they were intended,) a permanent waste-dam has been substituted. The dam at Maiden's Adventure, from its importance to that part of the canal which is dependent upon it for a supply of water, claimed the most prompt attention; and accordingly, as soon as the water of the river had sufficiently subsided, operations were commenced upon it by the public hands on the 30th day of May, and it was completed on the 31st day of August, at an expense not exceeding the original estimate.

A part only, of the paving, which was thought to be advisable by the former Commissioner, has been executed; the balance was omitted, because it was deemed unnecessary, and if found to be so hereafter, may be more cheaply executed, with the advantage of water transportation for the materials upon the canal. Gravelling the tow-path has been omitted for the same reasons.

There has been expended and paid, upon the whole work, from the first day of December, 1824, to the first day of December, 1825, the sum of $115,801 69, which will appear in detail, by the table which accompanies this report.

There will be wanted, to pay balances due upon contracts, damages ascertained and to be ascertained, for raising and repairing the banks, to build a farm-bridge for Mr. Sampson's accommodation, to complete the lock-keeper's house at the lower arch, and the fencing, about nine thousand dollars.

The wooden locks which form a communication by water, between the basin in this city and the dock, are in bad order, and too much decayed to admit of being otherwise repaired than by a thorough re-construction. They are considered, however, as a very useless appendage to the canal; and the propriety of their being discontinued by law, is respectfully suggested.

The ground which they occupy, with the use of as much water as is necessary for their operation, to be applied to other purposes, would sell for a considerable sum, applicable to other works of much greater public utility.

By the dam at Maiden's Adventure, the fall of the river has been completely overcome for about ten miles above it, affording excellent river navigation for that distance; and the same result has been produced by the completion of the dam at Fore's. These facts exhibit a remarkable and very interesting contrast between the expense of improving the navigation of the river upon its own bed, by means of dams and locks, and that of making the independent canal. In the one case, two dams with a lock in each, erected at an expense of about forty thousand dollars, furnish the most perfect *river* navigation for twenty miles; in the other, twenty miles of independent canal has been found to cost ten times that amount!

Some enactment by the Legislature seems to be necessary, for the purpose of establishing proper regulations upon the canal, and preventing wanton injury to the works by persons employed in its navigation. The locks, especially, whose floors are of plank, will soon be perforated and destroyed by their spike-poles, unless measures are adopted to prevent it.

JNO. STAPLES, *Commissioner*

Of James and Jackson's rivers.

December 10, 1825.

A TABLE,

Shewing the sums of money paid under the several contracts made for the completion and repairs of the James River Canal, *from the Basin, in the City of Richmond, to the Maiden's Adventure Falls, from the* 1*st day of December,* 1824, *to the* 1*st day of December,* 1825.

Names of Contractors.	*Objects of expenditure.*	*Sums paid.*
Moncure Robinson, eng'r. to the former Com.	For his salary,	$ 1000 00
Do.	Disbursements as engineer, agent, &c.	809 63
John Bosher,	Dam and lock at Fore's,	5321 25
Do.	Keeping the lock in the dam,	450 00
Wilson Bryan,	Guard-gate, flood-gates and bridges,	575 38
Do.	Foundation of culverts,	32 84
John G. Crouch,	Excavation,	400 00
Lancelot Woodward,	Furnishing timber,	982 90
Do.	Fencing,	617 40
Do.	Building bridge,	56 00
Scrymsor, Young & Bryson,	Walling,	32 50
Scrymsor & Young,	Ditto,	2859 50
John G. Gamble,	Building locks,	1161 00
Charles Griffin,	Raising banks, building bridges, planking and puddling culverts, &c. walling and embankment,	3670 84
Do.	Excavation and embankment,	758 65
Do.	Culverts, ditches and clearing out the canal,	250 00
Knox & Hale,	Raising banks and bridge slopes,	1064 40
Do.	Excavation and embankment,	746 94
Baker & Richards,	Dover aqueduct,	100 00
S. D. Crenshaw,	Furnishing lime,	100 00
Jordan Faris,	Furnishing timber and plank,	719 95
William Gill,	Ditto ditto,	512 60
Robert P. Baker,	Building bridge,	75 42
Jasper Crouch,	Taking care of sick hands,	646 63
Robert & Charles Hyde,	Bridges and wastes,	682 25
David I. Burr,	For castings,	1650 00
Richard Walsh,	Excavation and embankment,	1170 42
James Stewart,	Excavation, walling and embankment,	4896 12
Lydall Bowles,	Fencing,	311 00
Stephen Philan,	Excavation,	1239 50
Stephen Duval,	Fencing,	1800 00
Do.	Building bridge,	475 00
Richard Reins,	Furnishing materials and labour, and paying all incidental expenses,	18100 00
Adams & M'Vee,	Stoney Creek culvert,	1147 12
Do.	Walling and embankment,	191 95
John Gilmer,	Paving banks and building bridge,	1461 80
Do.	Walling and embankment,	1025 50
	Amount carried forward,	$56844 49

Names of Contractors.	*Objects of expenditure.*	*Sums paid.*
	Amount brought forward,	56844 49
Warner W. Minor,	Excavation,	382 00
Do.	Graduating Genito Creek, ditching, &c.	1440 95
Do.	Making a road,	270 00
Dunn & Philan,	Excavation,	1040 55
John L. Hazard,	Paving,	250 20
Lawrence & Ledgerwood,	Tuckahœ aqueduct, excavation and embankment,	4555 10
Ledgerwood & Lawrence,	Guard-lock at Maiden's Adventure,	3293 72
Do.	Re-building guard-lock at Tuckahœ, &c.	2214 10
William M'Kim,	Superintendent of work,	420 00
Lewis Webb & Co.	Furnishing lime,	375 00
Reuben Nash,	Fencing,	648 59
Delany & O'Neal,	Excavation,	65 00
Philip S. Pleasants,	Building bridge,	103 05
Jos. Morrison,	Building bridge,	48 30
James Burford,	Raising and widening banks,	500 00
Do.	Several contracts for walling, embankment, bridges, wastes, excavation and cleaning out the canal,	7231 65
Ephraim Child,	Excavation and embankment and building bridge,	887 50
Do.	Fencing,	700 00
Robert Ware,	Ditto,	370 00
Azel French,	Completing Dover aqueduct and lock in Sampson's,	1384 11
Do.	Building Bullock's bridge,	386 05
Do.	Re-building wall at the upper arch,	477 00
Do.	Waste dam at Ferguson's,	752 00
Do.	Abutments of masonry,	317 25
Jonathan Leslie,	Guard-lock and aqueduct at Beaver-dam Creek, culvert at Willow Branch, excavation and embankment,	11551 66
David Wallace,	Masonry of bridges,	1807 82
John Dolton,	Building waste dam at Ferguson's,	1075 50
John P. Shields,	Embankment in Ferguson's,	995 00
Do.	Repairing dam at the lower arch	922 98
Do.	Excavation of stone and earth in the lower feeder, repairing embankment at old locks, clearing off weeds, &c.	498 45
Do.	Embankment about the waste dam in Ferguson's,	130 00
Do.	Repairing two breaches in the old canal.	299 59
Fisher & Smith,	Furnishing timber,	1492 01
French & Jordan,	Furnishing lime,	750 00
Tinsley & Brown,	Building bridges,	501 50
Samuel Cocke,	Furnishing timber, building bridges and wastes, and fencing,	879 38
Cornelius Murphy,	Building bridge,	485 20
Michael Lehy,	Excavation and embankment,	522 54
James M'Dermot,	Ditching,	345 62
Doct. R. W. Royster,	Attending the sick,	105 00
Royal Farrar,	Excavation,	283 37
Samuel Woody,	Filling up coal yards on the Basin,	160 00
Miles Cary,	Keeping locks,	80 00
John Carter,	Building lock-keeper's house,	50 00
	Amount carried forward,	$ 107892 23

Names of Contractors.	*Objects of expenditure.*	*Sums paid.*
	Amount brought forward,	$107892 23
Sundry persons,	For damages, condemnations of land and stone,	5684 46
		$113576 69
Randolph Harrison,	One qrs. salary as Commissioner,	625 00
John Staples,	Three qrs. salary as Commissioner, &c.	1350 00
	Error in addition brought forward,	250 00
		$115801 69

JNO. STAPLES,
Commissioner.

REPORT

OF THE

Commissioner of the Kanawha Road and Navigation.

TO THE GENERAL ASSEMBLY OF VIRGINIA.

In conformity to an act making more effectual provision to carry into effect the act entitled, "an act to amend the act entitled, 'an act for clearing and improving the navigation of James river, and for uniting the eastern and western waters, by the James and Kanawha rivers," and in obedience to the various laws which have since been made on that subject, the commissioner of the Kanawha road and navigation most respectfully reports, that he has unremittingly attended to the long line of very important public improvement, which the Legislature has been pleased to confide to his superintendence and direction. The improvement of the navigation of Kanawha river, is nearly completed from its confluence with the Ohio river, to the Red-house shoal on the 62d mile, agreeably to the survey of the river by Thomas Moore, the late Engineer of Virginia, reported to the Board of Public Works in

January, 1820. Some part of this line of improvement may require dressing in the spring. This shoal is the most difficult to improve, and the most expensive of any on the river: it is really cutting a canal through rock around it on the right side of the river, and extending it up into the deep water. When completed, it will be easy and safe navigation; it has advanced to where it begins to enter the deep water. Johnston's shoal on the 53d mile, is nearly completed. More work will be done on Tyler's shoal next season, by col. Thompson, (under his contract,) to make the navigation of it more complete. On examining the sluice in Elk shoal, on the 37th mile, near Charlestown, it is found that the current is very strong; and to make it easy navigation, it will be necessary to remove the wing-dam, and to excavate the upper end of the sluice, about 18 inches deeper, and to extend it up into the deep water. This will require an excavation of 1600 cubic yards of hard compact gravel, which must be removed a considerable distance. A contract with David Smiley, for doing this work, is on paper marked A. If next season should be friendly to the operations on the river, it is expected that the navigation will be completed to Charlestown; and from this point to the Salt-works, is smooth water. The greatest difficulty in making the sluices good up-stream navigation, is to graduate them so as to check the current as much as possible. Strict attention has been paid to this by making jetties, and adopting other measures. It is necessary that the Legislature make provision by law, for the collection of the toll on this river. This will be attended with some difficulty. The best place to collect the toll is at Red-house shoal, 25 miles below Charlestown.

The following plan is respectfully proposed for the consideration of the Legislature, to wit: To have an office at Charlestown, where every boat descending the river, with its loading, and the names of the owner and navigator of the boat shall be entered, and a duplicate of this entry, sent by the navigator of the boat to the collector of the toll at Red-house, where it shall be paid agreeably to the duplicate; these two offices would be a check on each other. And, as to the up-stream navigation, the boat and cargo may be entered at the office at the toll-house and the toll paid accordingly, and a duplicate of such entry sent to the office at Charlestown. The quantity of salt made this year, is estimated at between eight and ten hundred thousand bushels, from which an estimate can be made of the amount of toll on that article. The paper marked E, shows the amount of orders given on the Second Auditor, in favor of

Epley & Morrison, the contractors for improving the river below Charlestown, since the last report.

Kanawha Road.

This road is considered finished, agreeably to contract, from Covington to Montgomery's ferry, which is 124 poles below the Great falls. A statement of the toll which has been collected on it prior to the 14th of this month, is on the paper marked F, which is only one month and fourteen days after the time which Caruthers was to have completed the road agreeably to his contract with the James River Company, bearing date the 29th December, 1821. There is some ambiguity in the present tariff of tolls. Every man is required to pay 5 cents at each gate: does this include all who travel the road on foot, and ride in a carriage, as well as on horse-back? Those who live on the road within 4 miles of a gate, if they do not travel more than 4 miles on the road, are exempted from paying toll; when they who live 10 miles off the road, and only travel 1 mile on it and pass a gate, pay toll. Some of these privileged men, living on the road within 4 miles of a gate, have sold property to those living 10 miles off, and delivered it to the purchaser beyond the gate, thereby avoiding the payment of toll. It will be necessary to revise the tariff of toll, and make it better accord with the current small change of money; and, as the road in a few months will extend down the river from Gauley bridge near 7¾ miles, it will be better to increase the toll at the bridge, than to set up another gate below it. As all are exempted from working on the road and keeping it in repair, will it not be better to exempt none from paying toll, except those at whose house a gate may be erected? That all who live within 4 miles of a gate, and do not travel more than 4 miles on the road, shall pay half toll, and that the superintendent of the road have a discretionary power to contract with neighborhood travellers to pay semi-annually, making a reasonable reduction. The crossing of Greenbrier river by the turnpike and old roads, is represented in a map of the turnpike road which accompanied your Commissioner's last report. When the Greenbrier bridge is completed, it would be a public advantage to discontinue that part of the old road which crosses the river; consequently, a contract is made with Henry B. Hunter, on whose land is this part of the road, by which it is stipulated, that the said Hunter, his family, servants and customers, going to his mill and smith-shop, shall be exempted from paying toll; and, that he shall make to the James River Company a title in fee simple for one acre of land for a toll-house lot, and close and fence up the old road, on condition that the Legislature pass a law authorising the discontinuing of this part of the old road. The paper marked G, is a revision of the tariff of toll, respectfully submitted to the consideration of the Legislature.

In conformity to the 7th section of the act entitled, "an act authorising a loan for the purpose of internal improvement," passed the 8th of March, 1824; and to the 4th section of the act entitled, "an act making farther provision to carry into effect the act entitled, 'an act for clearing and improving the navigation of James river, and for uniting the eastern and western waters, by the James and Kanawha rivers," &c. passed the 16th of February, 1825, your Commissioner has succeeded in cancelling, conditionally, the contract with David Smiley, bearing date the 24th of October, 1823, for improving the navigation of Kanawha river, from Slaughter's creek to the Great Falls; in consequence of which, a contract was made with Smiley, bearing date the 24th of April last, to extend the turnpike road from Montgomery's ferry to the lower end of Loop Creek Shoal, four miles and 38 poles, at the average price of $1100 per mile. This section of road, which was almost impassable for carriages, and was hard to make, is now nearly completed. On examining the route below Loop Creek Shoal, it was deemed necessary to extend the turnpike one mile and 148 poles farther: this will extend the road over the worst ground, and make a good way for the people of the east to go to the Salt works. Contracts are made with Smiley and F. Carrel, to make this farther extension of the road, for the average sum of $800 per mile. Your Commissioner has not succeeded yet in cancelling with Epley and Morrison that part of their contract which relates to improving the river from Charlestown to Slaughter's creek; and the county court of Kanawha not having made provision to erect and complete a bridge over Campbell's creek, in conformity to the 5th section of the last recited act, it was deemed proper not to contract at this time for extending the road any farther.

Bridges.

The one over Gauley river was finished early last summer, eably to contract, and it is believed to be the best bridge e State: it now appears that it will be a great advantage to the bridge to line the floor with plank; this should be done next summer. An agreement has been made with Miles Manser, (who is employed to take care of the bridge and collect the toll,) to build a back shed to the toll-house, and to make some other improvements on the toll-house lot, by contract bearing date the 8th of this month, marked H. When these improvements are made, which will cost but a small sum, this will become a valuable stand; for the use of which, the bridge will be taken care of, and the tolls collected. At present, this service is performed three per cent. lower than at the other gates, and it will draw the attention of a man of respectability to attend to this interest. It is necessary that the collectors of tolls should have some other employment, that would not interfere with the duties of their office, to aid them in making a support. The bridge over Greenbrier river will probably be finished in April next; the masonry is done, the frame and arches up, and the floor laid in one of the passages, and travellers on horse-back and in carriages, now pass over it. Mr. Moore is entitled to much credit for the permanent manner in which he has made these bridges, and his indefatigable attention to business. A statement of the orders given in his favor to the Second Auditor, for this work, since the last report, is in the paper marked I. Some waggoners are in the habit of driving over bridges with their waggons locked. It is necessary that some provision should be made by law, to punish all depredations committed on this road. A statement of orders given on the Second Auditor, in favor of contractors on this road, is in paper marked K.

James River Canal in the Blue Ridge.

This work has been prosecuted successfully with unexampled spirit and energy. The section commencing at the mouth of the North river, which was contracted for by Messrs. Jordan and Irvine, is nearly completed. The average height of the dam across the river, is 10 feet and 9¾ inches, with a slope on the south end thereof, 50 feet long and 20 feet wide, for the fish to pass up the river; and a waste lock on the north end of the same, for the purpose of navigating the river until the canal is completed; and also to prevent the stoppage of the navigation, in case the canal should break, or require repairing in future. This lock is now in operation, and the guard lock is completed except setting up the gates.

The second section, which was contracted for by Messrs. John and Robert Gamble, is upwards of three miles long, and is in a state of great forwardness. The excavation and walling to near the lower end, are nearly done; the pits are dug and the floors laid, of five locks, which they were to build on this line; the walls of two of these locks are nearly up, and the building of two of the others had considerably progressed, when the work was discontinued at the commencement of the freezing weather.

The third section on the south side of the river, which was contracted for by Messrs. Lyman and Sanford Brown, which is upwards of 2½ miles long, has progressed very well; two of the locks are nearly finished, the pit for the guard lock nearly excavated, and the greater part of the work to do is to finish the excavation at the upper end of the line, the greater part of which is rock, to build the guard lock, and the two locks at the lower end, which is to introduce the canal into the river. It is believed that the work on the whole line is generally substantially and permanently done; but, as it is expected that the Principal Engineer will report on this subject, your Commissioner deems it unnecessary to make any farther observations on the quality of the work. Nearly all the stone for facing the locks is quarried, and the greater part transported to the sites of the locks, and dressed, ready for use; and the remainder is brought to the river, to be transported by water. It will be necessary to have a bridge to assist boats to cross the river. On reflecting on this subject, it was deemed most advisable to make a cheap strong bridge, supported by trussels securely morticed into water-sills firmly bolted with iron bolts to the rocks, with intervals of 48 feet, for the water, and floating timber to pass, on the same plan of the bridge at Pattonsburg. A bridge supported by stone piers would be very expensive, as the stone suitable for such work would have to be transported a great distance. In conformity to notice given in the newspapers, several proposals have been made to make this bridge. The offer of a gentleman, who proposes to make the bridge for about $ 3,500, exclusive of the abutments, is accepted. As the embankment which will be necessary to defend the lock on the north side of the river, will be part of the abutment of the bridge, there has not been time to make an estimate of the cost of the abutments. This bridge will only be necessary to the navigation of the canal, but it will tate the travelling interest, and the annual toll for crossing ridge will be considerable, and at this place the toll should be collected, both for the canal and the bridge; consequently, there is laid off here a lot for a toll-house. What has increased the expense of this canal more than was anticipated, was the difficulty in many places in the mountain of getting materials to make the embankments; and the great distance clay was to be transported for puddle, and for lining the canal. The excavation of rock under the surface of the ground, was more than was expected, and the procuring of stone to line the locks was attended with great difficulty.

Your Commissioner foresaw the difficulty of procuring good stone, and hesitated a considerable time as to the propriety of building the locks of brick. But, in consequence of having to transport the brick a considerable distance, for want of good clay to make them, which is essential to make permanent locks, and a quarry of excellent stone being found within three miles of the North river, which it was supposed would furnish a sufficiency of stone for all the locks, he concluded to build them of that material. But, in the progress of the work, the stone in this quarry became exhausted, and it became necessary to transport it a much greater distance; however, these difficulties are now nearly overcome. A statement of the orders, given since his last report, on the Second Auditor, in favor of the Canal contractors, are in the paper marked J. It is expected, that this whole line of canal will be completed before the first of next September, in a permanent manner; which will greatly benefit an industrious and enterprizing population of a populous and fertile country west of the Blue Ridge, which was formerly entirely excluded from market, unless it encountered the labor and difficulty of transporting its produce, and its necessaries in return, over a formidable ridge of mountains, or the more dangerous and equally laborious course by water, which nature seems particularly to have marked out; but, the obstacles and perils of which, nothing less than the enterprize and perseverance of its energetic citizens could have surmounted.

Notwithstanding the economy used by your Commissioner, it appears, from reasons above stated, that the construction of this line of canal will cost more than was anticipated. From the progress of the work towards completion, an estimate has been made of the probable expense: By which, it appears, it will cost near $ 340,000. It may not, however, cost so much, as it is the understanding of the Commissioner and the contractors, that when the canal is finished, all the measurements and estimates of work, as far as practicable, are to be examined, and all errors which may appear, to be corrected. It appears, by the paper marked L, that from the commencement of the work to the present time, orders have been given to the Second Auditor, to issue warrants on the Treasury, in favor of the contractors, and other expenses, to the amount of $178,178 91, which, taken from the above sum of $340,000, will leave the sum of $161,821 09; which sum, it is supposed, will be necessary to complete this section of canal, and $36,010, to complete the works on the western line of improvement; which will make the sum necessary to finish the whole line of improvement under the direction of your Commissioner, amount to $197,831.

In October, 1824, there was a sale at public auction, on a credit of twelve months, of property belonging to the James River Company, which was left by captain Bosher at Cole's mouth. The sale amounted to $518 52¼; $153 46¾ thereof has been settled in the payment of claims against the company; $251 55½ thereof is in notes not yet collected, and the balance, which is $113 50, has been collected in cash; a full account of which, will be immediately forwarded to the Second Auditor.

Your Commissioner has no doubt of the propriety and policy of improving the navigation of Kanawha river, and believes the revenue arising from the transportation of salt, (the manufacture of which has greatly increased,) bacon, flour, whiskey, merchandize, &c. will not only justify the expenditure on this section of improvement, but will, in a few years, refund it. As to the Kanawha road, its utility, in opening a direct communication between the eastern and western country, and thereby forwarding the grand scheme of internal improvement, and the benefit which it affords to an active and enterprizing population of an extensive and generally fertile territory, through which it passes, in affording the necessary comforts of life, will, in time, compensate the expense incurred, and trouble encountered, in its construction. The revenue arising from the transportation of salt, for the supply of Greenbrier and the neighboring counties, will be considerable; and, in the event of the improvement of the roads leading from its eastern and western extremities, the travelling interest will be very much increased. Another important advantage, arising from this improvement, is the inducement which it offers, to settle and improve an uncultivated section of the State, some parts of which are capable of supporting a dense population.

About the middle of last month, your Commissioner, reflecting on the important Public Works confided to his superintendence, deemed it necessary to examine the whole line to the western extremity, to enable him to make a special report. This journey he has performed, (which is not much less than 250 miles,) and, on his return, found it necessary to examine the works on the canal before he made his report. He hopes, that the extended line of improvement committed to his care, and the necessary multiplicity of business which it creates, will be deemed a sufficient apology for his report being forwarded at so late a date.

Most respectfully, your's, &c.

WILLIAM ANDERSON, *Commissioner,*
Kanawha Road and Navigation.

December 23d, 1825.

N B. The upper section of the canal being nearly finished, will enable him to dismiss his assistant engineer.

[F.]

Tolls collected at Metzker's on the Kanawha road, from 20th September, 1824, to 25th April, 1825,	$439 96
Deduct his commissions,	31 25
Nett amount,	$408 71

Tolls collected on the Kanawha road from April, 1825, *to* 14*th September,* 1825, *viz:*

At Gauley bridge,	$205 55
Metzker's,	145 42
Gate near Crist's,	168 58
White Sulphur Springs,	296 08
Gate near Callaghan's,	200 86
	$1016 49
Deduct commissions and charges,	121 51
Nett amount,	$894 98

Tolls collected on Kanawha road for the quarter ending 14th December, 1825, viz:

At Gauley bridge,	$387 97
Metzker's,	289 24
Crist's,	237 44
White Sulphur Springs,	248 87
Callaghan's,	204 91
	$1368 43
Deduct commissions and expenses,	108 49
Nett amount,	$1259 94

Note.—The foregoing is a summary of the statements rendered by the Commissioner.

◆

[L.]

An estimate of funds which will be necessary to finish the public work under the superintendence of the Commissioner of the Kanawha road and navigation, in conformity to contracts which are now made.

		Due when the work is done.
Epley & Morrison, contractors for improving Kanawha river, by contract they are entitled to	$41132 00	
They have been paid,	19680 00	
		21452 00
For contingencies,		500 00
Smiley, on Elk shoal,		1190 00
Moore, contractor for building the Greenbrier bridge,	18000 00	
He is paid,	8000 00	
		10000 00
For additional work, probably,		1000 00
Carrell & Smiley, when their contract is finished for extending the Kanawha turnpike road,		1868 00
Amount carried forward,		$36010 00

Amount brought forward,			$36010 00
Suppose the canal to cost,		340000 00	
Last year there was paid,	52056 91		
This year there is paid,	126122 00		
		178178 91	
			161821 09
			$197831 09

Agreeably to the above estimate, the funds necessary to complete the aforesaid improvements, will be $ 197831 09, exclusive of the pay of the superintendents of the work. As the upper section of the canal is nearly finished, I will be able to dismiss the assistant engineer.

WM. ANDERSON,
Com. K. R. & N.

December 20, 1825.

From the above statement, it appears that the work on Kanawha river, and extending the Kanawha road, agreeably to the contracts now made, will require to finish them,	$36010 00
And the canal,	161821 00
Making as above,	$197831 00

Exclusive of the pay of the superintendents of the work.

SECOND AUDITOR'S REPORT,

Under a resolution of the House of Delegates, calling for information relative to the

ROAD, CANAL, AND RIVER COMPANIES, &c.

Second Auditor's Office, 11*th Feb*. 1826.

SIR—In obedience to a resolution of the House of Delegates of Thursday last, I have prepared and herewith transmit the following summary statements, viz:

A. Expenditures since February, 1820, out of the 1,030,000 dollars, obtained on loan.

B. Tolls and rents of water and ground on the lower canal, and the application thereof since February, 1820.

C. Revenue of the James River Company for the year 1825, and the application thereof.

D. General view of the state of the Road, Canal and River companies, in which the fund for Internal Improvement is interested, for the year 1825.

The last mentioned statement, which embodies the information contained in all the reports rendered during the last year by the several companies, will shew that tolls have been collected by all of them, with the exception of the Fairfax Turnpike Company, Monongalia Navigation Company, and Wellsburg and Washington Turnpike Company; that the whole amount of the said tolls, during 12 months past, was $67,428 37 cents, the greater part of which has been consumed by improvements, repairs and expenses, and interest on debts; dividends only to the amount of $11,327 75, having been declared, to wit: by the Lynchburg and Salem Turnpike Company, 3½ per cent.; Swift-Run Gap Turnpike Company, 2 per cent.; and by the Little River Turnpike Company, 5 per cent. The fund for Internal Improvement participates in the dividends of the two latter only, on subscriptions made by the State previously to the establishment of that fund. From the silence of the Lynchburg and Salem report on the subject, it is to be presumed that they have as yet finished no section of their road. The fund is entitled to share in the dividends declared by them in proportion to the payments made from it, when any section is completed.

I have the honor to be, sir, your most obedient servant,

J. BROWN, JR.
2d Auditor.

The honorable Speaker of the House of Delegates.

[A.]

Summary statement of the expenditures out of the one million and thirty thousand dollars obtained on loan, from the 17th February, 1820, to the 1st January, 1826.

On the canal from Richmond to Maiden's Adventure falls, - - -		623295 04
On the canal through the Blue Ridge, -		175627 24
On the Kanawha Turnpike Road, viz:		
From Dunlap's creek to the falls of the Great Kanawha,	118809 28	
For the continuation of the said road, in part, - -	5014 75	
For the bridge over Gauley river, in full, - -	18400 29	
For the bridge over Greenbrier river, in part, - -	8000 00	
		150224 32
On the Kanawha river, - - - -		53861 06
For one third of the salary of the Second Auditor and his clerk, since 1st March, 1823, - - - - - -		1881 16
Total expenditures,		$1004888 82

Amount of Loans,	1030000 00
Expenditures, as above,	1004888 82
Unexpended and in the treasury, -	$25111 18

E. E.

J. BROWN, Jr.
2d Auditor.

10th February, 1826.

[B.]

Summary statement of the tolls, rents of water and rents of ground which have accrued from these respective sources, and their application, since February, 1820.

Tolls on the canal to 31st December, 1825, - -	151565 43	
Rents of water, " "	18254 17	
Rents of ground, " "	2147 29	
	171966 89	
Deduct officers' salaries and contingent expenses,	*32699 54	139267 35
Tolls on the Kanawha road, in 1825,	1456 45	
Deduct toll-gatherers' commissions, &c.	94 29	1362 16
Balance of cash on hand the 17th February, 1820,		4467 39
Total amount nett,		$145096 90
Applied as follows:		
To payment of dividends,	103351 12	
To payment of interest on certificates of loan,	18526 61	
To the surplus fund, also applied to payment of said interest,	21685 98	
To improving the bed of the river,	1533 19	145096 90

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* The expenses of the 3 first years amounted to $23649 39, averaging nearly $8000 per annum. This apparently large amount is owing to the salaries allowed the President and Directors, ($1400 for all,) the treasurer ($750,) and overseers; and negro hire, provisions, cloathing, and other incidental expenses, with few or none of which, the revenue is now chargeable.

E. E.

J. BROWN, Jr.
2d Auditor.

10*th February,* 1826.

[C.]

Summary statement of the revenue of the James River Company, and of the application thereof, for the year 1825.

Tolls on the lower canal,	24476 00	
Rents of water on ditto,	3244 17	
Rents of ground on ditto,	350 00	
	28070 17	
Deduct salaries of toll-gatherer and lock-keepers, and contingent expenses,	3368 05	
		24702 12
*Tolls on the Kanawha Road and Gauley Bridge, to 12th September, 1825,	1456 45	
Deduct toll-gatherers' commissions and contingencies,	94 29	
		1362 16
Nett amount of revenue,		26064 28
Applied as follows:		
To the dividend for July, 1825, on 700 shares, or $ 140000,	8400 00	
To the dividend for January, 1826, on ditto,	8400 00	
To the surplus fund in July, 1825, for payment of interest on certificates loan,	7335 93	
To the surplus fund in January, 1826, for ditto,	1928 35	
		26064 28

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* Since the 31st December last, the Commissioner has made a return of tolls collected on the Kanawha Road for the 3 months ending the 12th of that month, amounting to the nett sum of $ 1294 62, which will appear in the accounts of the year 1826.

E. E.

J. BROWN, Jr.
2d Auditor.

10*th February*, 1826.

Extract relating to the improvement of James river, from Governor Pleasants' communication to the General Assembly, the 5th December, 1825.

"I feel at some loss what to say or recommend on the subject of this important work, of which the State is sole proprietor. Should the canal stop at Maiden's Adventure falls, to which point it is completed, little will have been gained for the money expended, except in having carried it far enough to enable the large boats to transport the article of coals; as I am of opinion, that the boats now used in navigating the river, will not shift their lading at Maiden's Adventure, but will continue on to Richmond. Should the independent canal be continued to Lynchburg, or even to Columbia at the junction of the two branches of the river, it would produce, I think, a different result, and by reducing freight considerably, would justify the Legislature in establishing such a tariff of tolls as would soon pay the interest of the money expended on the work. I recommend this view of the subject to the early and serious attention of the Legislature. Should their determination be adverse to prosecuting further, at this time, the independent canal, I would take the liberty of calling to their view, the improvement of the navigation above Maiden's Adventure by dams and locks. This might be effected, I am convinced, in such a way, as to remove the principal difficulties in low tides in the present state of the navigation, and at an expense comparatively small: Indeed, it is the opinion of some judicious persons, that in this mode, by dams and locks, a navigation for light steam-boats might be effected without difficulty. I am sanguine in the belief, that the early and deliberate wisdom of the Legislature, applied to this interesting subject, will produce a result highly beneficial to the State."

REPORT

OF THE

Committee appointed to examine into the Tariff of Tolls

ON THE LOWER SECTION OF

THE JAMES RIVER CANAL.

Your committee have also had under consideration, the resolution authorising them to revise the tariff of tolls imposed on the trade of James river, by an act of the last General Assembly, and to suggest such alterations therein, as justice and expediency may require.

In the consideration of this subject, your committee are constrained to adopt the conclusion, that the late tariff, by which the lower navigation of James river is burthened with an enormous increase of tolls, violates those sacred principles of justice, which are essential to the character of a free Government, and the preservation of the equal rights of the citizen. The dividends declared on the stock of the James river company, and the fact that the stock had attained a market value equal to one hundred per cent. on the sum advanced, is conclusive proof, that the old tariff of tolls, authorised by the charter of that company, was ample remuneration for the expenditures incurred. An augmentation of these tolls, in favor of that company, without further improvements made, or increased facilities afforded by them to the trade of the river, would have been an act of injustice too palpable to have escaped the notice of any one. If such a measure, in favor of the James river company would have been manifestly unjust in relation to that portion of the community whose trade it would affect, it is not perceived by your committee, how it can assume a different character from the circumstance that the State has succeeded to the *rights* of that company; for, whether the State or a company take the money thus exacted without any consideration given, the wrong is the same, in respect to the individuals who are compelled to pay it.

But, although the trade of James river, between the Blue Ridge and tide water, (the coal trade alone excepted,) has not, from the recent scheme of improvement, acquired any new facility; yet, in the prosecution of this scheme, very large expenditures have been incurred by the State; and it belongs to the consideration of this subject to enquire, where the burthen of this expenditure should rest. The governing principle which your committee would assume on this question, it is presumed no one will controvert. So far as a local benefit was designed, and has been conferred on any particular section of the State, the section so benefitted, ought to bear a just proportion of the burthen of such expenditure; and, on the other hand, so far as the object proposed was of a national character, in which the people of this Commonwealth have only a common interest, justice requires that the burthen should be borne in common, and not by any particular section of the community. It is indispensable, therefore, to note with precision, the true character and object of the undertaking in which this expenditure has been made. With this object, your committee have had reference to a series of public documents, in which they have traced the history and progress of the scheme of uniting the eastern and western waters by the James and Kanawha rivers, and find the great leading objects of the enterprise purely of a national character. It is true, that in the prosecution of this scheme, some local benefits were anticipated, especially to the western portion of the State; but these were minor considerations, and rather viewed as incidental to a great work, the hazard of which should be encountered only for the security of important political interests, and more extensive commercial advantages, interesting to the whole community. That no misconception or doubt may exist on this subject, your committee will refer to the documents themselves.

At the session of 1810, a resolution was adopted by the General Assembly, appointing Wilson C. Nicholas, James Breckenridge, William Caruthers, Andrew Donnelly, jr. and William I. Lewis, Commissioners to view the route of a central communication from the James river canal, to the Great falls of the Kanawha river. The inducement to this measure is stated thus, in the preamble to the resolution: "Whereas, it is a matter of great importance, not only to the good people of this State, but to our brethren of the Western States, that a better and more direct communication with the Atlantic should be opened between the eastern and western waters: *Therefore resolved,*" &c.

At the succeeding session of 1811, the Commissioners named in the said resolution not having performed the duty assigned them, an act was passed by the General Assembly, designating twenty-two gentlemen, any three or more of whom to act as Commissioners, with power to employ suitable assistants, to view the route, most direct and practicable, for a central communication between the eastern and western waters, commencing at the town of Lynchburg on James river, and terminating at the Falls of the Great Kanawha. The Commissioners were directed to report to the next General Assembly, stating the practicability of the scheme, "the probable expense thereof, and the prospect of advantage therefrom to this State, the States of Ohio and Kentucky, and the United States."

At the session of 1812, John Marshall, James Breckenridge, William Lewis, James M'Dowell, William Caruthers, and Andrew Alexander, Commissioners, named with others, in the said act of 1811, having performed the duty required by that act, reported their proceedings to the General Assembly. They state, that they "began at the bridge at Lynchburg, to view James river, and to take its level by sections to the mouth of Dunlap's creek"—that Mr. Alexander had been engaged to execute this duty under their direction, and to his report they refer for the minute detail of information required; and as to that part of the river comprised within the charter of the James river company, they say, that they "presume that little, if any, information is expected of them, other than will be found in the annexed report of Mr. Alexander." They then proceed in a lengthy and detailed report on the residue of the route viewed by them, and conclude with their views in relation to the advantages which would probably accrue from executing the work to which their report related. In relation to the advantages which would probably accrue from executing the work, they divide the subject, and consider separately—"first, those which may reasonably be expected to result from executing it in part: next, those which are to be looked for from executing it in the whole." The following extracts will sufficiently indicate the views of the Commissioners on this branch of the subject. "*Should the navigation of James river be carried up to the mouth of Dunlap's creek, and a turnpike road made over the Alleghany mountain,* although nothing further should be done, a considerable impulse will be given to the agriculture, and a valuable effect produced on the wealth and population of a considerable tract of country.

It cannot reasonably be doubted, that *Bath*, a part of *Botetourt*, and a great part of *Greenbrier*, *Monroe*, and perhaps even of *Giles*, would find a real interest in searching for a market on James river, for the produce of their soil, if such safe and cheap conveyance were afforded them, as might be given by the improvements which have been stated. Agriculture would mingle more than heretofore with grazing; and industry would flourish, when the reward of industry should be attainable—An increase of population would result, not only from the check which this state of things would give to emigration, but also from its operation on the inhabitants in other respects." "These advantages would probably be extended by improving the navigation of the Greenbrier also."

"Should New river be rendered a safe and easy channel of communication, between the Ohio and the commercial towns on James river, the subject will assume a more important aspect, and the advantages may be estimated on a larger scale. Not only will that part of our own State, which lies on the Kanawha and on the Ohio, receive their supplies and send much of their produce to market, through James river, but an immense tract of fertile country, a great part of the States of Kentucky and Ohio, will most probably give their commerce the same direction."—"Certainly, in a contest for this interesting prize, the States through which those rivers, (the James and Potowmac,) run, have geographical advantages, the benefit of which they can lose only by supineness in themselves, or by extraordinary exertions in others."—"Let the importance attached, by men best acquainted with the subject, to the commerce of the west, attest its value. The exertions which other States appear to be making to secure it, will probably awaken the attention of Virginia to that part of it which should naturally belong to her."

"There is another aspect in which this subject deserves to be viewed." "That intimate connection which generally attends free commercial intercourse, the strong ties which are formed by mutual interest and the interchange of good offices, bind together individuals of different countries, and are well calculated to cherish those friendly sentiments, those amicable dispositions, which at present unite Virginia to a considerable portion of the western people. At all times the cultivation of these dispositions must be desirable; but, in the vicissitude of human affairs, in that mysterious future which is in reserve, and is yet hidden from us, events may occur to render their preservation too valuable to be estimated in dollars and cents."

"The immense works meditated in New-York, will certainly, if executed, give to that State great advantages in a competition for the trade of the lakes. But, if other convenient and more direct channels be opened, it is not probable that the commerce of the Ohio will take the circuitous route by the lakes." "Your Commissioners, however, take the liberty to repeat, that the success of any attempt to obtain that share of the commerce of the west, to which this State, from her geographical situation and rivers, would seem to be entitled, must depend entirely on the safety and cheapness of her navigation." "If the views of the Legislature shall extend to a free commercial intercourse with the western States, or any of them, the channel selected for that intercourse, will come in competition with others which now exist, or may be opened, and must recommend itself to a preference by the advantages it offers. With a view to (this) object, no improvement ought to be undertaken but with a determination to make it complete and effectual."

At the session of 1813, the General Assembly adopted a resolution, directing the Executive to cause the report of Commissioners, made at the preceding session, on the subject of connecting the eastern and western waters, to be re-printed, and a copy transmitted *to each member of the Congress of the United States, and to the Executives of the several States and Territories.* It is declared, in the preamble to this resolution, that the proposed improvement would "greatly promote the welfare of this Commonwealth and the prosperity of our sister States," and that "*the Legislature of the Union,*" as well as "*the Governments of the several States*, cannot but feel an interest in the accomplishment of an enterprise *so important to the Arts, Manufactures and Commerce of the United States.*"

At the session of 1814, the committee of Roads and Internal Navigation present this subject, in their report on Internal Improvements generally, as one of the first magnitude. They say, that, "in a *national* point of view, the connecting the waters of James and Great Kanawha rivers, is an object of such magnitude, your committee hope the Legislature will never lose sight of it until its completion. This communication once made, opens, with little difficulty, a passage through the Ohio, Muskingum, and Cyahago rivers, to Lake Erie. From the waters of the Lakes, according to M'Kenzie's account, a communication can be had with the Columbia river, with as little difficulty as would attend that between the James and Kanawha rivers. Thus, a water communication could be opened across this vast continent, from the Atlantic Ocean on the one side, to the North Pacific Ocean on the other."

At the session of 1815, Governor Nicholas, in his message to the General Assembly, urged the consideration of the subject of Internal Improvements in the strongest terms; pointing out such objects as he regarded of primary importance, and the sources from which the requisite funds might be drawn. "To improve," he says, "the navigation of James river to its source, and connect it with the waters of Greenbrier and Kanawha rivers, by a turnpike road, *would confer incalculable benefits, political and commercial.*" The committee of Roads and Internal Navigation, to whom so much of this message was referred, as related to Roads and Internal Navigation, made a lengthy and able report on the subject, concluding with the outlines of a plan for creating a fund, and for prosecuting, on an extensive scale, the Internal Improvement of the country; and, at the same session, the act creating the "Fund for Internal Improvement," was passed. On the connection of the eastern and western waters, the following interesting views are found in the report of this committee:

"While many other States have advanced in wealth and numbers, with a rapidity which has astonished themselves, the ancient dominion and elder sister of the Union, has remained stationary. A very large proportion of her western territory is yet unimproved, while a considerable part of her eastern has receded from its former opulence. The fathers of the land are gone where another outlet to the ocean *turns their thoughts from the place of their nativity, and their affections from the haunts of their youth. Beyond the Alleghany, an unexpected revolution threatens the Atlantic States in general, the accomplishment of which will create new interests and views in that flourishing and important section of America,* and bar forever the hope of re-uniting it by commercial ties to the markets of the east."

"If it be true, as your committee confidently believe, that in a connection between the Roanoke, the James, or the Potowmac river, with the waters of the Kanawha or Ohio, this Commonwealth possesses the best means of arresting the progress of this revolution, it is a duty which she owes not only to herself, but to the Atlantic States, and to the Union at large, to call those means into action. Independent of the minuter circumstances, in the natural course and volume of her rivers, and the breadth and elevation of the intervening mountains, which point out Virginia as the proper channel of this connection; the superior mildness of her climate to that of her northern sisters; her position on the Atlantic coast of the United States; and the capacious bay which serves as the common estuary of her rivers, assure to her very high claims to the emporium of this commerce."

"The United States of America, restricted by the territory of England to the north, and of Spain on the south, describe an arch on the intervening ocean, of which *Virginia* is the *centre*, and should be the *key-stone;* sustaining the western States upon its broad and lofty summit, and binding the eastern and southern in solid, just, and fair proportion. First in asserting the independence of America, this Commonwealth will not be the last in giving to that independence stability, by confirming the Union, upon which it rests."

At the session of 1816, the president and directors of the Board of Public Works, in obedience to the act of the preceding session creating a Fund for Internal Improvement, made their first annual report to the General Assembly. This report contains the following remarks and recommendation, in relation to the connection of the eastern and western waters.

"There are several objects within the scope of the system devised by the General Assembly for the improvement of the interior of Virginia, which, in the present state of her wealth and population, it is beyond the reach of her unassisted ability to accomplish; but which, being equally interesting to her sister States, and to the government of the United States, it may not be impossible to further by their co-operation. Such is the contemplated connection between the eastern and western waters, by extending the navigation of James river to Dunlap's creek, and constructing an ordinary turnpike from thence to the Falls of Kanawha, or an iron rail-way across the Alleghany, and along the vallies of Greenbrier and New rivers, to the same point. The Board of Public Works beg leave, therefore, to recommend it to the General Assembly, to invite the co-operation of the governments of the United States, and of the States of Kentucky and Ohio, in the accomplishment of those objects."

In pursuance of the recommendation of the Board of Public Works, the General Assembly adopted a resolution, instructing the Executive to open a correspondence with the governments of the United States, and of the States of Ohio, Indiana and Kentucky, for the purpose of obtaining their co-operation in uniting the waters of Kanawha and James rivers, by a short and improved portage.

At the session of 1817, the Board of Public Works, in heir Second Annual Report to the General Assembly, say, that "the connection between the eastern and western waters, early attracted the attention of the Legislature of Virginia: our illustrious Washington was scarcely freed from the arduous service of the revolutionary war, before he called the attention of his native State to this important undertaking: the exhausted state of the country rendered it impracticable then, to execute such a work, but its importance was then, and has been frequently since recognised. In the last Annual Report from this board, this object was strongly recommended to the Legislature; and, under the fullest impression of its importance, Mr. Baldwin, the engineer, was directed to examine the obstructions to the navigation of James and Jackson's rivers, between the mouth of Looney's creek, near Beal's bridge, and the mouth of Dunlap's creek: the obstructions to the navigation of the Great Kanawha river, between the Great Falls in that river, and its confluence with the Ohio; and to survey and mark out the best route over which an artificial road may be formed, from the mouth of Dunlap's creek, on Jackson's river, to the Falls of the Great Kanawha river; and to report plans and drawings thereof, with estimates of probable expense, &c. The report made pursuant to this instruction, is now respectfully submitted, and will enable the Legislature to decide between the different modes of forming the connection." This report of the engineer, and the estimates therein, being confined to the object of extending the facilities of communication westwardly, from the point to which the navigation of James river was already opened, upon the same scale with the improvements on that river, for the accommodation of the internal commerce of the country between the upper navigation of James river and the Ohio river: the Legislature, looking beyond this local benefit to more important commercial and political advantages, adopted the following resolution:

"*Resolved*, That it shall be the duty of the Board of Public Works to take such measures as may seem to them best, to cause an accurate survey to be made of James river and its branches, for the purpose of ascertaining the best means of improving the navigation thereof; and especially, of ascertaining the practicability and expense of procuring a navigation of said waters, or any part of them, *for vessels drawing three feet water;* and that the said board report thereupon to the General Assembly, at their next session."

At the session of 1818, the third annual report of the Board of Public Works was made to the General Assembly; but the report of the surveys made pursuant to the resolution of the preceding session, not being then prepared, that subject was reserved for a supplemental report. This supplemental report, was made the 19th of January, 1819, accompanied with a report of the Engineer, (Moore,) containing his surveys, plans and estimates, with a view to alternative methods of improving the navigation of James and Jackson's rivers, to the mouth of Dunlap's creek: one plan embracing a navigation by means of dams, canals and locks, and partly by the natural bed of the river improved, affording at all times *three feet* depth of water, estimated to cost $1,512,926 86, with one kind of locks, and $1,108,475 80, with another; the other, a *sluice navigation* on the best principles, giving *two feet* water, at all times, to the mouth of the Cow Pasture river, and thence 18 *inches* to Dunlap's creek, estimated to cost $190,421. The report of the board was also accompanied by a document from the James River Company, the result of conferences with the board, containing terms and conditions on which that company would consent to a modification of their charter, by an augmentation of their capital, to the amount of $1,500,000, for the object of further improving the navigation of James and Jackson's rivers, according to the plan estimated by the Engineer; (Moore,) to cost $1,108,475 80; of improving Kanawha river, from the Great falls to the Ohio, according to the plan of the Engineer, (Baldwin,) estimated to cost $45,000; and of connecting the eastern and western waters, by a road from the mouth of Dunlap's creek to the falls of Kanawha river. By the terms proposed for a modification of the charter of the James River Company, the shares of old stock, of $200 each, held by the company, were to be rated and stand on the books, at four shares of $100 each, in the new company; the Board of Public Works were to subscribe two-fifths of the whole stock of the company, that is say, $71,200; the company were to receive, during the progress of the improvements, dividends of six per centum per annum, payable half yearly; and after the completion of the improvements, nett dividends from tolls, not less than ten, nor more than fifteen per centum per annum: to enable the company to pay which dividends, the then tariff of tolls on the James river, was to be forthwith revised and increased, so as to yield double the then produce: when the improvements reached Lynchburg, the rates of tolls were to be gradually augmented on sections below that place; and as the improvements advanced to the highest navigation of the waters of James river, a further augmentation of tolls to be made; and as the improvements advanced by certain sections, on the residue of the route, by the road and the Kanawha river, certain tolls were to be imposed. The Board of Public Works, in this supplemental report, after adverting to the important political and commercial effect of the proposed improvement, refer to the resources proposed for its accomplishment, and conclude with a recommendation of the scheme proposed by the James River Company. They say, "the tolls now paid upon the James river, amount to $35,000 per annum, and are gradually increasing: the toll proposed upon the salt passing down the Kanawha, together with a reasonable toll on other articles which are brought up that river, for the supply of those engaged in salt manufacture, the inhabitants of Charlestown, and the adjacent population, would yield a revenue of $30,000 per annum: This, together with the tolls of the James river, increased as proposed, would present resources for carrying into effect the whole improvements proposed by the James River Company," &c. "The Board of Public Works are not possessed of sufficient information, to enable them to form a decisive opinion, as to the most judicious method of improving the navigation of the James river: that object, however, in connection with the proposed communication with, and improvement of the Great Kanawha, is believed to be well worth any expense which can be necessary to procure the best navigation of which the river is susceptible; they therefore recommend it to the patronage of the Legislature, by passing a law to the effect proposed by the James River Company."

This supplemental report of the Board of Public Works, being referred to the committee of Roads and Internal Navigation, "with leave to report thereupon by bill or otherwise," a bill was reported to the House of Delegates in conformity with the recommendation of the Board. This bill fairly submitted to the representatives of the James river section of country, the proposition of throwing upon the trade of that section the burthen of an improvement of the James river, below the Blue Ridge, upon a scale not called for by the nature and extent of that trade alone, but which had reference to more extensive commercial and political objects in which they had only an interest in common with the whole community. By this bill, their views and wishes were tested. Though willing to unite with their fellow citizens in the prosecution of a great national scheme, which had been long regarded as of such general utility, as to be worthy of the attention of the General Government; yet they were unwilling to submit to an impost, to be levied upon their industry exclusively, for an object in which they had only a common interest. The consequence was, that this bill did not obtain the sanction of a law, and the mode which it proposed, for accomplishing this great work, seemed to be abandoned. The intention, however, of prosecuting the scheme, upon some just and equitable principle, was still preserved by the Legislature; and with a view to that object, the Legislature adopted a resolution, on the 26th of February, 1819, directing new surveys, plans, estimates, &c. to be prepared by two Engineers separately, or in conjunction, under the direction of the Board of Public Works, for the information of the next General Assembly. This resolution was adopted at the instance of the delegate from the city of Richmond; it has a preamble in these words: "The General Assembly of Virginia, deeply impressed with the importance, (as well in a *political,* as a *commercial* view,) of connecting the eastern and western waters of the State, by means of the James and Kanawha rivers; *and anxious to extend to an enterprise of such magnitude and interest, their legislative patronage;* and believing that any scheme calculated to effect this purpose, must necessarily involve a considerable expense, which cannot be reduced to any precise estimate, without the aid of preliminary trials, and skilful Engineers; and deeming it proper, that the next Legislature, as well as the individuals who may be disposed to embark in this great work, may be able to judge with more certainty, as to its practicability and probable expense: *Be it therefore resolved,*" &c.

At the session of 1819, the resolution of the General Assembly, of the 26th of February, 1819, having been complied with; the Board of Public Works, in a supplemental report, laid before the Legislature the reports of the principal engineer, Mr. Moore, and assistant engineer, Mr. Briggs, containing the new surveys, plans and estimates. The Governor accompanied these reports by a communication, from which the following extracts are taken:

"The skill and industry of two able engineers, successively employed, with the science of a geometrician of the first order in our country, have at length demonstrated this grand conception of the Legislature to be practicable, by means entirely within their power; and the report now made, shews that the execution will be unattended with any derangement of the established course of finance, *or the least pressure upon any part of the community.* All minds seem at last to have cast off the prejudice derived from countries differently governed, *and to have settled in the belief, that improvements of such magnitude can properly be undertaken by the General As-*

sembly alone. The competition with other States of the Union, so honorable and useful when confined to such objects, is encouraged and supported, by the consideration of the peculiarly advantageous circumstances which a more happy climate, and more favourable approach from the sea, manifestly afford to Virginia. The inland navigation contemplated, will be suspended by ice, the only possible obstruction, not every year; and then, one-fourth of the time only which must be experienced by our less fortunate rival; besides the sea-risk upon the tempestuous lakes which her commerce must pass, before it can meet ours in the markets of the western States. The subject is now mature for the decision of the Legislature; and upon that depends what *Virginia* shall be twenty years hence: whether as now; or with a great and flourishing commerce; populous and wealthy cities; re-occupied plains on the east, and peopled mountains on the west; *a connexion founded on mutual interests with the great population of the western States,* for the most part driven originally by the want of profitable employment from her own territory; *and the mighty influence such advantages cannot fail to create, for the preservation of order, free principles, and union in the confederacy.*"

The Board of Public Works recommended that the improvement be made on a scale commensurate with the design of facilitating the extensive commercial intercourse with the western States, which had at all times given to the scheme its chief importance; and proposed a plan for effecting the improvement by sections, the whole estimated cost of which, including 25 per cent. for contingencies, they stated at $ 2,383,736. They proposed an expenditure of $ 120,000 per annum, and a completion of the work in twenty years. From two sources, the *Coal* and *Salt* trade, a considerable revenue was anticipated in the early progress of the work, which, with that object, it was proposed should be first accomodated in the order of executing the work. Having given the estimates, on which they found their recommendation of the plan proposed, they say—"All these considerations being weighed, it seems to be a reasonable conjecture, *that the present rate of tolls on James river need never be raised.* It is believed, that upon a pledge, (for the payment of interest,) of 2 cents per bushel upon *Salt* on the Kanawha, with other tolls on the same river according to the tariff reported to the General Assembly, in the supplemental report of the last year; and of 2 cents per bushel on *Coal* on the James river; and of the *present James river tolls,* after setting apart a sufficient fund thereout, to pay the ordinary expenses of collection and repairs, and for compensating the present stockholders; with a *power* reserved to the Legislature, *to impose additional tolls on the James river as the works may progress and become useful;* and of the tolls on the road; together with a provision, that any deficiency in the payment of the interest, from the funds so pledged, shall be made good out of the income of the fund for internal improvement; the sums necessary for carrying the foregoing plan into execution, may, from time to time, be borrowed as they may be wanted. It is understood that the James river canal company are disposed, for the sake of promoting this important object, to come into any terms which shall effect it, whilst the value of their existing rights shall be secured to them."

This report of the Board of Public Works was laid before the General Assembly on the 25th of January, 1820, and on the 17th of February, 1820, the Legislature, in accordance with the recommendation of the Board, passed the act, "*to amend the act, entitled, 'an act, for clearing and improving the navigation of James river,' and for uniting the eastern and western waters by the James and Kanawha rivers.*" This act was made subject to the ratification of the James River Company, on or before the 15th of March, 1820; was to take effect immediately on such ratification, and be thereafter considered *a* COMPACT *between the Commonwealth and the Company;* subject, however, to be changed or modified by the Legislature, provided that such change or modification should not affect the right of the company to the dividends allowed them by the act, or impair the security pledged to them for the payment of interest on loans to be obtained by them under the faith of the act. By the terms of the act, the company became an agent, holding *in trust for the benefit of the Commonwealth,* with authority to borrow $200,000 per annum for the purpose of effecting the proposed improvements. They were *first* to render the Kanawha river navigable, at all seasons, for boats drawing at least three feet water, from the Great falls to its junction with the Ohio: *secondly,* to improve the navigation of James river, from tide water to Pleasants's island, by locks and avigable canals, affording at all seasons, three feet depth of ter, and so as to navigate conveniently, boats carrying 1000 shels of coal; *thirdly,* to make the best practicable road from mouth of Dunlap's creek to the falls of the Kanawha river, cording to the suggestions of the report of the Principal Enneer; *fourthly,* to make navigable canals and locks from

Pleasants's island to the mouth of Dunlap's creek, according to the same report, as nearly as may be, affording three feet depth of water at all seasons; and *fifthly*, to make safe and convenient communications from the river, at such points, as would afford ample accommodation to the trade on the river. A tariff of tolls was prescribed for the use of the improvements, when made, on the Kanawha river and road; and, as soon as the canal and other works were completed, from tide water to the highest point on James river, where coal is raised, a toll of two cents per bushel was imposed on all coal passing the same, or any part thereof. The improvement on James river, from tide water to Pleasants's island alone, being calculated to facilitate the coal trade only, (inasmuch as the old improvement was already sufficient for the other trade of that section,) a toll was imposed, on the completion of that section only, upon *no other article than coal.* The just rights and interests of that section of country immediately connected with the navigation of the James river, seem to have been carefully guarded by this act. That the facilities afforded by the old improvements in the navigation of the river, (to which they had a right, because they had paid for them,) should be preserved to them until better were provided; it is declared in the 11th section of the act, that the James River Company "*shall*, at all times hereafter, keep the bed of the river, above the point to which any new improvement contemplated by this act shall be completed for use and connected with the river, and below Crow's ferry, as good and convenient for navigation as it now is," and that *additional tolls* should not be imposed, 'till some *new* and *equivalent* facility to transportation was afforded, the ninth section of the act, by which a pledge is made, that as the works progress, *and contribute to reduce the expense of transportation* on the James river, the Legislature will authorise tolls to be collected thereon in convenient sections, &c. contains a proviso in these words: "That such additional tolls *shall not exceed one third of the saving in transportation, up and down the said rivers, which will accrue thereby to those who use the said improvements*, taking the average price of transportation for three years last past as the basis of the estimates;" and provision is made for ascertaining this average price of transportation, through a commissioner in each of the counties on James river, from Botetourt to the city of Richmond, and making the same a matter of record. By this act, the stockholders of the James River Company were to receive, out of the tolls and other income of the company, for twelve years next after the 1st of January, 1820, a dividend of 12 per centum per annum, in semi-annual payments; and forever thereafter, a dividend in like manner, of 15 per centum per annum. For the payment of the dividends secured to the company, and of the interest on loans to be obtained for carrying on the improvements, the nett produce of the tolls authorised by the act, and of all other income of the company, was pledged; and the *surplus* of such tolls and income was to be paid into the treasury to the credit of the fund for internal improvement. Any deficiency which should happen at any time, in the nett produce of said tolls and other income, for the payment of such dividends and interest, was to be made up out of the income of the fund for Internal Improvement, to the extent of $12,000 per annum.

At the session of 1820, an act was passed to amend the act of 1819. The first section of this act, authorised the James River Company, until otherwise directed by law, from time to time as might seem expedient, to graduate the tolls on *Salt* on the Kanawha river; and on *Coal* on the James river, so that the same be not less than *one*, nor more than *two* cents per bushel; the General Assembly being of opinion, "that the Coal trade on the James river, and the Salt trade on the Great Kanawha river, ought to be fostered and encouraged." The 8th section restrains the James River Company from borrowing money under the act of 1819, "except so far as they shall be expressly authorised by act of Assembly, fixing the amount so to be borrowed." The 9th and 10th sections, set apart and appropriate $18,000 per annum of the income of the fund for internal improvement, for the payment of interest and purchase of the principal of loans for carrying on the improvements. The 11th section authorises the company to borrow $300,000, exclusive of $50,000 already borrowed from the Literary Fund.

At the session of 1821, an act was passed, directing the transfer of 210 shares of the stock of the Bank of the United States, "to the credit of the fund set apart for the payment of the interest and the purchase of the certificates of the James river loan," to be in satisfaction of $23,370 59, then due to that fund for arrearages of the annual appropriation thereto, out of the fund for internal improvement; and also directing the future unexpended balances of that annual appropriation, to be invested in some productive fund, till wanted for the object of its appropriation, and then to be converted into money.

At the session of 1822, an act was passed, "making more effectual provisions for carrying into effect," the act of 1819. The 5th section authorises a further sum, not exceeding eighty thousand dollars, to be borrowed, if found necessary, "*to the completion of the three first sections of the work,*" described in the second section of the act of 1819. By the same section the nett produce of the tolls and other income of the James River Company, together with the annual sum of $18,000, to be paid out of the revenue of the fund for internal improvement, are pledged as a fund for payment of the dividends to the stockholders of that company, and of the interest on loans made, and to be made to said company pursuant to law: and the *General Assembly* moreover pledge themselves, that *they* will provide *such other revenues,* as shall be necessary to pay the interest on any loan authorised by law to carry into effect the improvements mentioned in the act.

At the session of 1823, an act was passed, authorising the further sum of $400,000, to be borrowed, for the purpose of *completing the works commenced,* on the Kanawha road and river, and the James and Jackson's river canal, to Maiden's Adventure Falls, *and making and constructing a canal* along the margin of James river, from the lower end of Irish falls, in the county of Amherst, to the mouth of the North river in the county of Rockbridge. The 2d section repeals the pledge contained in the 5th section of the act of 1822, with a provision, in case the funds so pledged should be inadequate, in these words: "Until such other sufficient funds shall be provided by law, so much of the revenue of the fund for internal improvement, as may be necessary to supply the deficiency, is hereby pledged for that purpose." The 4th section, "for the purpose of ascertaining the best practicable, and most expedient improvement in the navigation, from the Maiden's Adventure Falls to the mouth of Dunlap's creek, and the probable cost thereof," directs the Board of Public Works to cause a *new survey* to be made by the civil engineer of the State, aided by some able and experienced engineer of another State, and by three commissioners the most experienced and judicious that can be selected for the purpose; but in the mean time, the engineer of the State to locate the canal between the Irish falls and the mouth of the North river. The 8th section, directs the Board of Public Works to report to the next Legislature, "a proper tariff of tolls which ought to be paid for the passage of a canal through the Blue Ridge, between the Irish falls and the North river, if such canal were made, *and a proper tariff of tolls, to be paid on the lower navigation, when the improvement to the Maiden's Adventure Falls shall be completed."*

At the session of 1824, it appeared, that the canal through the Blue Ridge had been located, and the execution of the work contracted for; but that the new survey directed, and other duties devolved, by the act of 1823, upon the Engineers and Commissioners, had been but partially executed, and resulted in some conflict of opinion. A further loan appeared to be necessary for completing works commenced, which the committee of Roads and Internal Navigation recommended that authority should be given to borrow. But the committee being of opinion, that the interest upon $350,000, amount of the new loan proposed, would create further "demands upon the fund for internal improvement, unless other resources should be found adequate to the payment of that interest;" also recommended, that the "tolls on the lower section of the James and Jackson's river canal," be increased "to such an amount, that an additional sum of $20,000 in tolls, shall be received therefrom." A few days after this committee had reported on this subject, a report from the Board of Public Works, with the tariffs prepared under the act of the preceding session, was laid before the General Assembly. On the 10th of February, 1825, an act was passed, authorising the further sum of 200,000 dollars to be borrowed, *for completing the works commenced,* and for extending the Kanawha road from the Great Falls to the lower end of the Salt Works in Kanawha county, in lieu of the improvement in the navigation of the river above the town of Charlestown. The second section of this act repeals the pledge contained in the second section of the act of the preceding session. The 20th section, enacts a tariff of tolls for the use of the mountain section of the James river canal; and the 19th section prescribes *a new tariff greatly augmenting the tolls on the lower navigation of James river, to go into operation as soon as the canal "from the basin in the city of Richmond, to Pleasants's island, should be completed."* Against the passage of this act, the representatives of the counties between the Blue Ridge and tide water, interested in the navigation of James river, strongly remonstrated; because, for the purpose of remunerating an expenditure, which afforded to *them* no *peculiar benefits,* and gave to *them* no *new* facilities of transportation, it imposed upon *their* trade, and particularly upon *their* agricultural products, an enormous *increase of tolls.*

From the foregoing review, it appears to your committee most manifest, that the leading objects of this enterprise are of a national character, in which the citizens of this Commonwealth have a common interest as members of the same political body; that it was undertaken on a scale not called for by the trade of the country bordering on the line of the improvement, and with a view to accommodate an extensive trade from the exterior, and to secure to the whole community great political advantages anticipated therefrom; that it was in truth a great State affair, the expense of which could neither be borne by the internal trade on the line of the improvement, nor hazarded by individual enterprise. The amount of population, compared with the extent of territory through which this improvement is proposed to be carried, does not admit of that extensive commercial intercourse which forms the principal support of artificial roads and canals. It could not, therefore, be undertaken with a view solely to the intercourse between the two extremes, and along the intermediate ground to be occupied: but, for the purpose of opening a communication with a most extensive exterior navigation, and inviting the commerce of the western States with the Atlantic to flow through this new channel, it was an interesting national object, and in that view, deemed worthy of public patronage. An undertaking of such magnitude, can only be sustained by persevering in that spirit of energy and patriotism which influenced the public councils to embark in it. Without its complete accomplishment, the leading objects of the scheme can never be attained, and much the greater portion of the expense already incurred, must be wholly useless, and productive of no benefit whatever, either general or local.

It has been seen, that the scheme of effecting this improvement by a joint-stock company, as proposed by the James river company at the session of the Legislature in 1818, proposed to burthen the *trade of the country through which the improvements were to pass*, with an amount of tolls sufficient to compensate the adventurers for interest on, and the risk of, the capital to be expended; and, that they did not ask for the stockholders, in the then company, greater benefits than were conceded by the succeeding Legislature, as the value of their existing rights. On this mode of effecting the improvement, the sense of the Legislature was tried at the session of 1818: it was found to be unjust, if not impracticable, and was consequently abandoned. At the succeeding session of the Legislature, (to use the language of the president of the Board of

Public Works on that occasion,) "all minds seemed to have settled down in the belief, that improvements of such magnitude can properly be undertaken by the General Assembly alone;" and accordingly, an act was passed for purchasing out the rights of the James river company, and embarking in the proposed improvements on State account. The very mode adopted for effecting the improvement, characterises the enterprise as national, and not local, in its leading objects: it is a departure from the uniform course of legislation on such subjects, where local advantages are the principal inducements to effect an improvement. The mere discussion of the proposition made at the session of 1818, was sufficient to excite fears, that, in the prosecution of a scheme of improvement so costly, the internal commerce, along the line of improvement, might be burthened with new or increased imposts, without any new or increased facility being afforded. Hence, in the act of 1819, by which the State undertook this great scheme of improvement, it is seen, that the possibility of such oppression and injustice is most cautiously guarded against. In relation to the navigation of James river, (where improvements had already been made, and a tariff of tolls existed, which liberally compensated the adventurers for the use and risk of their capital,) that act was particularly careful to secure to those interested in that navigation, *their right to the advantages of the existing improvements*, until others should be substituted, and to *fix the principle on which the existing tolls should be increased* for the use of any new improvement which should be made: this security of their rights, in respect to the existing improvements, 's found in the 11th section; and the principle on which the existing tolls should be increased, as well as the limit to that increase, is found in the 9th section. The new tariff of tolls on the lower navigation of James river, as proposed by the Board of Public Works, and as modified and adopted by the General Assembly in the act of the last session is; however, a departure from the principles laid down in the act of 1819, under which the Legislature embarked in this scheme, and affects, most injuriously, the trade of that section of the community on which it operates. It violates those principles by imposing additional tolls where no additional improvement has been made, which contributes to *diminish the expense of transportation*. It is admitted, that the works completed, from the basin in the city of Richmond, to Maiden's Adventure falls, (and which are the only new improvements on James river, between Richmond and the Blue

Ridge;) do not contribute to diminish the expense of transportation, except on the article of coal; and, on the completion of this section of the improvements proposed on James river, additional tolls on that article alone, were contemplated and provided for by the act of 1819. The trade on the James river, between the Blue Ridge and tide water, with the exception of the coal trade, has no new facility afforded to it, and is burthened with the same expense of transportation that existed before the new improvements were commenced. In short, the Board of Public Works, in proposing the new tariff of tolls, did not profess to found the increase of tolls upon any article except coal, upon the consideration of any increased facility afforded to the trade of the river; they admit that none had been afforded; that no benefit had been conferred. They said that they considered the new tariff justified, "in every alteration from the former, by strict propriety, and *still more* by the *necessities of the Commonwealth!*" If this tariff, producing in the aggregate an enormous increase of tolls, affecting the trade of a particular *section* of country only, without even a pretence of any benefit conferred as an equivalent, can be justified on any principle of justice, your committee are at a loss to ascertain what that principle is. They are satisfied, that "*the necessities of the Commonwealth*" have become, in the prosecution of this scheme, extremely urgent; and the recommendation of the new tariff may have been induced "*still more* by the *necessities* of the Commonwealth," than by "strict propriety;" but, they can find no "justification" of a local tax in such considerations. The burthen of relieving the necessities of the Commonwealth, can never be thrown, with propriety, upon any *section* of the community; that burthen should be borne in common by every portion of the community.

It has been said, that the act of 1819 contains no pledge to the *people*, that the tolls on James river should never be raised but in consideration of a saving in the cost of transportation, by reason of improvements thereon; and that the proviso of the 9th section, limiting the pledge as to the imposition of tolls, was intended only to restrain the expenditures of the James river company as the agent of the State. Your committee do not concur in this construction of that act. The James river company, as the agent of the State, were not restrained, or intended to be restrained, in their expenditures, by the proviso of the 9th section: they had complete authority, and were expressly *required* by that act, to borrow, *on* *the credit of the Commonwealth*, the specific sum of two hundred thousand dollars annually; and, in the event of a deficiency of nett revenue, from the tolls and other income pledged by the act, under the limitation referred to, for payment of the interest on the money so borrowed, a further pledge was made of a portion of the revenue of the fund for Internal Improvement. The dividends of the James river company were to be first paid, and whether the surplus was sufficient to pay the interest on the loans, concerned the Commonwealth only, for the money was to be borrowed on the credit of the Commonwealth, and not of the James river company. Your committee regard the 9th section, with its proviso, as containing a declaration of the principles which were to regulate the imposition of tolls on the James river navigation, in the progress of the proposed new improvements thereon: because, at the preceding session, a proposition to undertake those improvements on different principles was rejected; and, because the principles declared in that section, and the proviso, are consonant with justice and the equal rights of the citizen.

The Commonwealth having succeeded to the *rights* of the James river company, would seem, by consequence, to be bound by the *obligations* of that company. It cannot be questioned, that the Commonwealth is bound, by the contracts of the company, to supply the mills located on the James river canal with the water stipulated for in consideration of the rents agreed: and, upon the same principles of justice and good faith, she would seem to be equally bound to perform the obligations of that company, to afford at all times the stipulated facilities of navigation, in consideration of the tolls which the company were authorised to demand therefor. The local advantages of any section of country, whether natural or artificial, for the transportation of agricultural products to market, always constitute an ingredient, and frequently the principal ingredient, of value in the lands; and this is as much the right and property of the proprietor of the land as the soil itself; every purchaser pays his money for it, and arbitrarily to deprive him of it, even for public purposes, without compensation, would be as much a wrong as to deprive him of the land itself. To burthen the use of those facilities of transportation with new and additional impositions, without any equivalent benefit conferred, is a wrong of the *same character* with a total deprivation of those facilities, and differs from it only in the *degree* of injury inflicted.

It is now, as it was in the commencement of this scheme of improvement, a fair subject of calculation, whether the prospect of realizing the great political and commercial advantages anticipated, is such as to justify the Legislature in persevering to its final accomplishment; or, whether these advantages are not too problematical to justify the hazard of so large an expenditure as would be required. If the scheme be wholly abandoned, then it is manifest, that as the greater part of the expenditure already incurred has been productive of no advantage to the internal commerce of the State on the line of the improvements, it cannot be just to tax that commerce to cover such expenditure. Such expenditure will have been incurred by the State in pursuit of a national object found unattainable, either because the scheme was visionary, or there was a want of the requisite energy and patriotism, to carry it on; and it would become a national loss—as much so as if the money were thrown into the sea; and should, therefore, be borne by the State. So far, however, as any local benefits have been secured, to the trade of any section of the State, in the prosecution of this scheme, it is just that the trade so benefitted should bear the burthen of remunerating such expenditure.

Your committee having carefully examined, and deliberately considered this subject, are of opinion, that the tariff of tolls, imposed on the lower navigation of James river, by an act of the last General Assembly, ought to be revised, on just and equitable principles, and so reduced as that the aggregate revenue therefrom, exclusive of the article of coal, shall not exceed what would accrue from the old tariff.

REPORT

OF

C. CROZET, Principal Engineer,

ON THE

CONTINUATION OF THE CANAL

FROM

MAIDEN'S ADVENTURE FALLS

TO THE

MOUTH OF DUNLAP'S CREEK.

RICHMOND:
Printed by Shepherd & Pollard.
1826.

Report, &c.

To the President and Directors of the Board of Public Works.

Gentlemen,

In compliance with a resolution of your honorable body, in date of the 17th of December, 1824, requiring "*The Civil Engineer of the State to report an estimate of the cost of continuing the canal from Maiden's Adventure falls to the mouth of Dunlap's creek, upon the scale contemplated by the several acts of the General Assembly, with such other information upon that improvement, as his Survey during the Summer will enable him to impart to this Board;*" I most respectfully submit the following report, which I regret much it was not in my power to lay before you sooner. An examination of all the books and calculations which accompany it, together with the number and manner of execution of the maps, will convince you that it would have been impossible to complete the whole of this laborious task during the end of the session of 1824–'25. The completion of it having been suspended by the field-operations of last year, I had calculated, that after my return to Richmond in the fall, I should have ample time to finish it before your meeting, but sickness disappointed my expectations and wishes.

From the circumstances which marked the progress of the scheme of improving the James and Jackson's river, as well as from the terms of the law of the 8th of March, 1824, and the great importance of the subject, it appeared obvious that the new survey must be a careful and minute revision of preceding operations. This duty was therefore performed, so far as it has proceeded, with a critical attention to all the circumstances which might have an influence on the execution of this great work.

Not only successive *experimental* levels were run, within the probable limits of the location of the canal, and the courses and distances measured, for the purpose of obtaining a general knowledge of the ground over which the canal must necessarily pass; but also, at each station, the cross section of the ground was taken, shewing its acclivity and declivity to such a distance as would necessarily embrace the intended location: so that, without going again over the ground, the level could be easily transferred to a higher or lower point by a plain calculation or diagram, and the estimate modified accordingly. Besides these measurements, longitudinal sections were taken whenever undulations, requiring either embankments or deep excavation, occurred between two stations: among these, the most important are the sections across the beds of the numerous streams intersected by the line, which were carefully measured, and every ascertainable circumstance relative to them, recorded in the field-books.

By means of such transversal and longitudinal sections, the best line of location may be readily determined and laid down on the map; and, with their help also, the exact quantity of excavation or embankment required at each successive step by the line of canal selected, may be calculated with great accuracy.

In order to complete the data necessary to the making of the estimates, the nature of the soil, together with other particulars, were noticed at each station; these remarks have served to regulate the prices.

In addition to the above measurements and observations, topographical sketches of the ground were taken at each station; they exhibit to the eye successive plans of the country traversed by the survey, and furnish much local information which could not be conveyed by words. The whole survey is comprised in nine field-books, and also four books of sketches, in which the corresponding stations are designated by the same numbers as in the field-books. These books have been deposited in your office.

The operation could not be completed in 1824: a distance of 43 miles, from Tye river to a little above Lynchburg, remained unsurveyed. This duty, in consequence of the repeal of the section of the act relative thereto, has not been resumed.

In running a line of successive levels, as a first trial over unknown ground, it would be impossible to embrace and combine on the spot all the circumstances, often very distant, which have an influence on each other, and consequently on the propriety of location of each part of the intended canal: the first survey may consequently be considered as a mere *experiment*. It happens generally, therefore, that it is followed by other surveys and examinations, until the best line of location be ascertained. But it is not impossible so to conduct a first survey as to obtain at once all the elements necessary to determine the route of the most advantageous location, and make correct estimates thereof. This was the object of the manner in which the field operations were executed; they were facilitated by the advantage we had, that some approximate idea of the ground before us could be anticipated from Thomas Moore's report and maps.

Whatever, in fact, may be the level run, provided it be within the probable limits of the location in view; and provided also, that the cross sections as well as the description of the ground, embrace all the practicable routes of the canal, it is always possible, without seeing the ground again, to determine all the particulars of the most eligible location: for, by means of the plans of the survey, circumstances, which on the ground could not be perceived and combined together, are brought to view in the small compass of a map, and their mutual influence is understood almost at one glance. Then the most advantageous route and level may be selected with ease and certainty; and, with the help of the slopes and distances exhibited in the cross sections, offsets may be calculated for each change of the experimental level run, and the line removed to its proper place on the plan, which is thereby made a correct map of the most eligible location of the canal. This requires only a series of plain, though laborious calculations of the successive profiles and sections furnished by the survey. A location thus carefully combined and correctly laid down on the plan, cannot fail to suit the ground best when transferred to it; which may be done, without difficulty, at any time afterwards.

From this succinct account of the operations in the field, it will appear evident that the levels tried on the ground, were only *lines of reference* or *base lines*,* raised or lowered merely for the convenience of the survey, and that in the field-books they neither indicate the actual place or lift of the locks, nor the levels of the final location, with which it will be seen on the maps, that they seldom coincide. The survey was only a preliminary operation, intended to obtain measures and other data, which must necessarily precede the determination of the best location and most eligible plan. Much, therefore, remained still to be done after the preparatory survey; all the elements procured by it, must be compared and discussed, the route adopted, the levels calculated and platted, the place and lift of each lock selected, the elevation and dimensions of the aqueducts investigated, &c. &c.; and lastly, estimates of the route and works fixed upon, carefully made.

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* It is proper to remark, that the lines mentioned here, have always reference to the water or surface line of the canal: the bottom line is sometimes, but, I think, erroneously preferred. In the case of a canal of the dimensions here contemplated, it is particularly advantageous to mark the surface line on the ground, as it strikes it very near the place where the centre of the canal should be to produce the least excavation; as is indicated by the diagrams.

This last and most important part of the duty, was expected to have been performed in concert with the board of commissioners and engineers constituted by the act of the 8th of March, 1824, upon the arrival of the engineer expected from New-York, when it was presumed that the preparatory measurement might have been ready to serve as a basis to the regular proceedings of this board, in their joint examination of the ground and calculations of the expense. The repeal of the part of the act relative to the survey, suspended farther operations.

Circumstances with which you are acquainted, have induced me to say more than I should otherwise have done, of the principles and object of the survey, which, if I mistake not, were misunderstood at the time: the preparatory measurement of the ground undertaken previous to the deliberations of that board, in order to facilitate them, having been, it seems, supposed to be a final and independent operation.

From the field-books, 19 maps have been prepared; they are numbered from 1 to 23, reserving four numbers for the distance which has not yet been surveyed. The maps exhibit the plan and profile of both the river and the canal as finally located; as also, the several lines of trial run, the altitudes measured, the streams crossed, &c. &c. and in one word, all the elements furnished by the successive operations, together with a topographical chart of the country within the extent of the survey. These maps have also been deposited in your office.

After having, by a diligent comparison of all the particulars noticed in the field-books, determined the most eligible line of location, and arranged its plan and profile on the map, the last and most laborious operation that remained to be performed was the estimate of the probable expense of the work. The calculations for this purpose have been arranged in a separate book, in such a manner that they might be easily comprehended and recurred to by any body: each station is designated in the same way as in the field-books, and each particular item of expenditure is stated in a separate column. So minute estimate would have been too voluminous to make part of this report; I have, therefore, presented here only a summary of it, and deposited the *book of estimates*, also with the field-books and the maps, in your office.

Having explained the successive operations which were gone through in the execution of this duty, I will now proceed to state the principles upon which the estimates were predicated, to which a general account of the route of the canal is a necessary introduction.

General outlines of the route.—The whole line has been divided into eight sections, each of which comprises the whole extent to which the same supply of water taken out of the river may be carried: each section forms, consequently, an independent portion of the canal.

The 1st section extends from Covington to the Rich Patch mountain.

The 2d section from the Rich Patch mountain to the North Branch of James river.

The 3d section from the North Branch to the crossing place at the Cushaw Falls.

The 4th section from the Cushaw Falls to Judith's creek.

The 5th section from Judith's creek to Joshua's Falls.

The 6th section from Joshua's Falls to Tye river.

The 7th section from Tye river to Scott's mill.

The 8th section from Scott's mill to Maiden's Adventure.

The 5th and 6th sections have not been surveyed, but have only received a rapid examination: it is somewhat doubtful whether a feeder should be taken from James river at Judith's creek; this would depend on the guaging of some tributary streams both above and below Lynchburg. If the survey should demonstrate it to be unnecessary, the 5th section would not be independent, but form the continuation of the 4th.

The 7th section, beginning at Tye river, may be supplied from James river; but would, I think, be more advantageously so from Tye river itself. It is principally because the survey did not proceed higher up than this river, that it has been made the beginning of a new section; if the operations had been completed, there is much probability that it would have made part of the 6th section, which takes its supply of water at Joshua's Falls.

Each section may evidently be constructed independently of the others; but could not be partially finished without an increase of expense: for, if the canal be carried upwards without reaching as far as the proper site of the feeder of the particular section in construction, the expense of an extra dam, guard-lock, &c. must be incurred, as is the case at Maiden's Adventure; the proper beginning of that section being, I think, at Rock Castle Falls: at the Blue Ridge also, the dam, guard-lock, &c. of the upper section might have been dispensed with, if the canal above it had been made at the same time; since the same supply of water might have been continued by an aqueduct across the North Branch as far as the Cushaw Falls.

If, on the contrary, the canal be carried on downwards and stop short of the place where a new feeder becoms indispensable, the locks, by which it is made to enter the river at the lower end, must evidently become useless when the canal is extended downwards, as will be the case at the lower end of the Blue Ridge canal.

From *Covington*, the north side of Jackson's river offers evident advantages as far as the *Island Fording:* from this point the banks are frequently very rugged, and a question of expediency often arises, whether to keep the same side of the river or cross over to get on better ground; in doubtful cases surveys were made on both sides; they resulted in a preference of the following route:

From the *Island Fording* to *Carnes's*, a little above the 237th mile, the northern side is preferable. At Carnes's the river must be crossed, for which an aqueduct appears indispensable: the canal will then continue on the south side down to the lower end of *Wood's Island;* a new feeder being taken from Jackson's river at the gap of the *Rich Patch mountain.*

At Wood's Island the line must be transferred to the north side of James river also by an aqueduct, and continue on the same side until it reaches *Shepherd's Island*, five miles below *Pattonsburg;* there, many considerations recommend the crossing of the river upon an aqueduct; it must, however, soon be re-crossed half a mile below *Rocky Point Mill*, either upon an aqueduct, or in the pond of a dam; the former is, I think, preferable.

From Rocky Point Mill to the *North Branch*, the canal must continue on the north side, and then, crossing the North Branch in the pond formed by the dam at the Witch Falls, unite itself with the section now constructing through the gap of the Blue Ridge, and which passes to the other side of the river half a mile above the *Cushaw Falls;* this is done in the bed of the river and without the assistance of a dam. The canal then keeps on the south side down to opposite the lower end of *Piney Island*, where, for the present, it is contemplated to take the river.

The canal, when extended downwards, should keep the south side, though there is but little choice; this section down to Lynchburg being, in my opinion, the most rugged and difficult of the whole river, as will appear from a glance at the 9th, 10th and 11th maps. The distance between *Judith's creek* and *Tye river* was not surveyed; but, having viewed the river, with the assistance of Ths. Moore's maps and report, I am convinced that it would be inexpedient to re-cross the river near Lynchburg, through Winston's Island, as advised by him; but, that the canal should continue along the southern margin as far as *Joshua's Falls*, half a mile above Galt's mill, where the river might be crossed upon a dam.

A feeder taken here, I am confident, would successfully carry the canal as far as *Scott's mill*, with the occasional help of many tributary streams, which would be more than sufficient to compensate the deperdition of water. At Scott's mill a new supply must be taken from the river, which might suffice as far as Maiden's Adventure, especially if the river was taken at the head of the pond out of which the present canal receives its supply.

From the foregoing account of the route it appears, that probably there would be but three dams between Covington and Maiden's Adventure falls, viz: one at Covington, the next at the Blue Ridge, and the last at Joshua's Falls.

A lateral, or, as usually termed, an independent canal along the margin of a great river, has to contend with difficulties, some of which are of frequent recurrence along James river. The most considerable are occasioned by numerous bluffs which extend quite to the river, and leave no other alternative than to encroach upon its bed by raising the canal on an artificial bank, protected outside by stone work: the great expense of this kind of improvement recommends to pass such cliffs on a low level; while, on the other hand, a higher level is advised by the elevation of the bottoms along the river, the height of its freshets and the necessity of preserving a suitable altitude to cross the great number of mountain torrents or tributary streams traversed by the line of the canal, in such a manner that they may not conflict with either the safety of the canal or the activity of the trade.

Tributary streams.—It is but seldom advisable to admit such streams into a canal. On the Languedoc canal, wherein most of the intersecting streams had been at first received, the error of this plan was soon discovered; and it was found indispensable to resort to the measure, both very inconvenient and expensive after the canal had been completed, of building culverts over all the tributaries. A mistaken attempt at economy is always the primary motive of this plan: but, even when the water of a stream is wanted as a feeder, it is more expedient to pass it under the canal by a culvert, and to bring the water from a higher point by a lateral cut. The quantity of stuff such streams bring down; the considerable, troublesome, and frequently dangerous swells to which they are subject; the difficulty of erecting tight and permanent dams across them; the interruptions the trade must inevitably experience from these causes, are considerations which, when duly weighed, can leave no doubt of the inexpediency of admitting them into the canal; a return to this error is a retrograde step to the infancy of the art.

It cannot be denied, however, that the building of culverts and aqueducts constitutes one of the most considerable items of the original expense of a canal; not only as regards these works themselves, but because the high level they require to allow a free passage to the water which flows under them, occasions very expensive embankments across the valley or ravine of each stream and frequently keeps the canal for a great distance along steep hill-sides where the excavation is usually considerable and often difficult.

Trace of the canal.—In general, as much as other considerations would permit, the level has been kept along the base of the hills, just above the low grounds; in this situation, the farms are passed through at less disadvantage, and the excavation, though not so easy as through the low grounds, is, notwithstanding, often less expensive: along a hill-side the level can always be pursued; the excavation is regular; whereas across bottom land, the level frequently sinks below, or rises above the ground, occasioning thereby either deep cuts or expensive embankments and puddling. Besides which, the low grounds seldom afford sufficient elevation to pass over streams; they are much more intersected by gullies and usually afford bad foundations for the works of art, and especially for aqueducts and culverts. The soil on low levels is also more porous and has the effect of rendering new feeders more frequently necessary.

Feeders.—It will appear from the account which has been given of the route of the whole canal, that the number of feeders, which have to be taken from the river, will be much less than might be supposed from their frequency in the lower part: this is owing chiefly to the numerous never-failing streams which empty into James river in the upper sections, whereas most of those below either are not to be depended upon or are objectionable on some other account. Feeders from the main river are always attended with much expense; they often keep the canal for a long distance exposed to the attacks of high floods, and generally require dams to be raised which are liable to accidents from which the trade may greatly suffer.

The dam at Covington is indispensable; that at the Blue Ridge has been made, and one more dam at Joshua's Falls will be requisite. The necessity of erecting a dam at Judith's Creek is doubtful: the feeders at the Rich Patch mountain, at the Cushaw Falls and at Scott's mill require no dam; the first and last of these will occasion hardly any additional expense.

From the Rich Patch mountain to the North Branch, the tributaries are more than sufficient to feed the canal. From the Blue Ridge to Judith's Creek many fine streams intervene, with the assistance of which, and of two apparently copious creeks below Lynchburg, it may, upon the continuation of the survey, prove practicable to reach Joshua's Falls, without touching the river at Judith's Creek. From Joshua's Falls many abundant streams will fill the canal as far as Scott's mill. All these tributaries are noticed in their place in the estimate below.

From Scott's mill, the canal may possibly continue to Maiden's Adventure without taking a new feeder from the river; yet as its supply from tributary streams would be less abundant than above, while the ground is not so retentive; it might perhaps become necessary to build a dam for a feeder at Rock Castle Falls if the pond of the dam at Maiden's Adventure was not used; as this would make a difference of nearly nine miles in the length of the canal.

Dimensions of the canal.—The canal is directed by law to be 30 feet wide and *not less than* 3 *feet deep;* I have estimated it for a depth of 3½ feet to correspond with the sections already finished. The tow-path is calculated to be 10 feet wide and 2 feet above the water. I have frequently introduced in the estimate the expense of a smaller bank on the side of the canal next to the hill, as a security against slips and leakage in bad places and especially along cliffs.

In some difficult places the width of the canal is reduced to 22 feet, which is sufficient for 2 boats of the largest size that can navigate the canal. In such cases the banks are calculated to be held up by small dry-walls or by slope-walls. Indeed, the plan of protecting the inside of a canal by stone work, when this material is abundant, should more frequently be adopted, as boats moving with some velocity will otherwise wear off the banks. It appears that the necessity of this plan has been felt on the N. York canal, but it would have been much cheaper if done at first. And in fact, in a great many places, the expense of these small walls may even be more than compensated by the advantage they afford of keeping the sides of the canal more steep, and consequently of diminishing the width of both canal and bank at the water-line, without lessening the water-way, which, of course, along rapid slopes would materially reduce the size of the bank.

Length of the canal.—The total length of the canal will be between eleven and twelve miles shorter than the river.

Puddling.—The method of lining the inside of the canal with puddle is considered very objectionable: the puddling has, therefore, been estimated as a perpendicular wall of good clay within the body of the bank and of a thickness no where less than 3 feet. When the bottom is also puddled, the course of clay is always supposed to be at least 2 feet thick and to be extended as far as necessary to be connected with the wall of puddle within the bank. In those cases where a bank on the side of the hill is introduced, it is also estimated as containing a wall of puddle connected with the stratum of the same material at the bottom: by this means the water of the canal is completely prevented from passing under the embankment, and producing those accidents to which canals, round cliffs especially, are so liable.

Locks.—The locks have been estimated according to the plan which has been ultimately adopted and constructed at the Blue Ridge; a copy of which has been left in your office to accompany this report. They are 10½ feet wide and 76 feet long in the clear: locks of these dimensions will hold the largest boats that can navigate a canal made on the scale required by law. The estimate contemplates the masonry to be laid in hydraulic lime to about one half the thickness of the walls, where in contact with the water in the canal. The breast wall is laid in hydraulic lime throughout. If, as may reasonably be expected, this important material should be discovered in the State, the locks would be made much cheaper: and in that case it would be practicable and advisable instead of resting them on a floor, to build them on a foundation of good water-tight masonry: hydraulic lime is preferable to the imported roman cement. I could not add much to what I have said in former reports on the importance of using hydraulic lime more freely in works exposed to a contact with water; the unfortunate and frequent instances of works destroyed, sometimes even before their completion, intimate more powerfully than arguments, the wisdom of insuring their stability by a well-timed expense, especially when so important and indispensable to the navigation of a canal as locks and aqueducts, whose destruction may have incalculable consequences.

The cost of the locks has been established by the quantity of actual work in each; and not by a specific price of the foot-lift; which is certainly an erroneous mode of calculating the expense of these works.

In the location of the route, I have endeavoured, as much as localities would permit to bring many locks near each other, reserving, however, a basin of at least 250 yards in length between them. Locks which thus follow each other closely, may be placed under the superintendence of the same lock-keeper; a considerable yearly saving in the employment of agents may thereby be produced, and will justify some addition to the original cost for the purpose of obtaining this advantage. In the upper part of the river, where the fall is great and several short cuts are made, this arrangement is frequently practicable, and even, in some places, without adding to the expense: but, in the lower part of James river, where the fall is small, it is but seldom possible to drop the line more than the lift of a common lock at the same place.

Aqueducts and Culverts.—These important works have all been estimated of masonry laid in hydraulic lime, wherever it comes in contact either with the water of the canal or with the stream over which they are built. When the elevation is not sufficient to allow of a proper bed of puddle on the crown of the arch, a thick coat of water-proof grout is calculated to be laid over it. In other cases, the banks of the canal are carried over the arch and the bottom is lined with puddle.

Aqueducts might be made of wood; but this plan is very objectionable, and although several have been made on the New-York canal, I do not think that the example should be imitated: wooden locks might be introduced almost with the same propriety. Works, whose existence and good condition are so essential to the object of the improvement and to the activity and certainty of the trade, should be substantially made; and only future expenses and losses will in general result from these ephemeric economies.

There will be four aqueducts across Jackson's and James river. The most considerable of those to be built over tributary streams, will be at Tye river, Rock-fish river, Hardware river, and the Rivanna.

Wastes have been estimated in a great many places, as being made of wood; though perishable, these works, by their getting out of repair, would not produce any interruption or inconvenience to the trade. In many instances, where the sites appeared favorable, the estimate for culverts or aqueducts was made to include wastes on their upper side; in this position wastes have many advantages, and among others, that of not interrupting the tow-path: they may either be part of the aqueduct or culvert, or be made in continuation of its wing-wall.

Paving and Walling.—Where the banks of the canal are exposed to abrasion from the current of the river, it has been customary to protect them by dry walls: against this plan there are many objections, which have been stated in my first report on the James river canal. The want of good foundations, the splitting or crushing of the stones, the difficulty of binding them well together, render them a precarious protection, while their heavy dimensions make them very expensive: to this may be added, that the fall of the wall usually produces a breach in the canal. The method of protecting the outside slope of a bank by *paving*, is both cheaper and more effectual. Stones which would not answer for making dry walls, may be used in paving; the work of building them is cheaper, the quantity of materials they require less; the bank made behind them is thicker, and consequently less liable to leakage. A slope covered with stones will resist a current better than a perpendicular wall; and even if some of the stones should be displaced, the fall of the bank is not a necessary consequence, as in the case of a dry wall; and the injury may be repaired without difficulty. As regards their comparative expense, the higher a paved bank is raised the cheaper it becomes, in proportion to one held up by a dry wall; it is only for very low levels that the latter is not more expensive than the former. This will appear evident, by considering that the cost of the wall increases in a duplicate ratio of its height, whereas that of the paving follows only the simple ratio of the same. I have, therefore, seldom introduced dry walls in the estimates.

Bridges form a considerable item of expense, not only on account of the wood and stone work they require, but also of the extensive embankment that must frequently be raised to attain their level. In general, for reasons of economy and to accommodate farmers, they are kept very low: this is, it seems, a great subject of complaint on the New-York canal; and it will be the case here, also, when large boats are introduced. The bridges which have been made on the canal have generally also the disadvantage that their abutments, projecting inside of the tow-path, are in the way of the tow-lines of boats, which will be worn out by them.

On the New-York canal bridges were indispensable on account of its depth; but on the James river canal, it appears to me, that fords might almost every where be substituted for them. The water in it being only 3½ feet deep, might be passed by waggons without any injury to their load. Stone to pave the bottom of these fords, is in great plenty all along the line; they would be both more permanent and cheaper than bridges, and would very probably be preferred by farmers: in addition to these, foot-bridges might be made at a small expense, and at a sufficient elevation to be out of the way of any boat. In the estimates I have introduced bridges agreeably to usage.

Fences are also a considerable cause of expense, which, like the condemnation of property, cannot be exactly estimated, as they are generally assessed by jury; but it seems to me that they might entirely be dispensed with, by using gates across the canal at such places where it is traversed by a fence: gates have been tried on the present canal; but, being hung in the usual way, they must inevitably be destroyed by the shock of boats towed by horses. I think it, however, quite practicable to use a kind of floating gates or fences, composed of two buoyant frames supporting a paling: these, in their ordinary position, would meet in the centre of the canal; and, by being made of a triangular form, would present themselves obliquely to the impact of boats, by which they would be made to recede towards the edges of the canal: any simple mechanical contrivance would bring them back to their position, after the passage of a boat. The frame of these floating gates might also be made to answer the purpose of a foot-bridge across the canal.

The excavation, in ordinary cases, has been calculated by means of a diagram, a copy of which accompanies the maps: it shews the number of cubic yards of excavation that will just make the bank of the canal along each particular slope, and consequently it gives, in every instance, the *least possible quantity of cutting*.

In a former report, I have had occasion to remark, that the least excavation for a particular slope of the ground was fixed, and that removing the centre of the canal from the *line of* *least excavation* towards the hill, must of course increase the cutting and produce a *spoil-bank;* whereas its being removed down the declivity, would require a more considerable bank, and thereby also increase the cutting, in order to obtain materials to make it: the diagram elucidates these principles very plainly. It cannot, however, be expected that the *least excavation* can ever be exactly obtained; and, therefore, some allowance has generally been made in the estimates for the inevitable excess of the cutting.

Where the ground is broken, and principally along cliffs, the diagrams could not be applied; in such cases, the calculations were more difficult and laborious.

In the course of the account of the estimated expense of the successive parts of the line, very material differences from Moore and Briggs's reports, will be observed: the most conspicuous have been particularly noticed. Some of these differences, however, exist throughout the whole estimate; all are reduceable to a fundamental cause: that they did not allow themselves time sufficient to perform this duty with the care it required. The works of art are all under-rated, the description of the ground is imperfect, and sometimes inaccurate, the price of excavation is frequently too low, and the quantity of it all along much below even the minimum that would be requisite to shape the canal: their usual statement is an average depth of three feet, sometimes four feet, and seldom more, for a certain distance. It is difficult to determine what, along a hill side, is understood by *the depth of cutting*, unless it should mean that the quantity of excavation is equal to that which would be produced by the stated depth of cutting through level ground; but the quantity of excavation furnished by three and four feet depth, is below that required on every slope greater than 7 degrees, which is much exceeded by almost every hill side pursued.

It is still more difficult to conceive the meaning of this expression, so frequently used by them: "*We can choose our depth of cutting.*" To *choose* the cutting, so as to exceed that which will just make the canal, is absurd; and it is unnecessary to add, that to choose it under that quantity, is impossible; and yet, in one case, the cutting is even *chosen* at two feet depth along a steep slope, as will be seen in a note, a few pages below. The declivity at the place alluded to, is as much as 24 degrees, which requires at least 32 yards of excavation to make a canal of the dimensions prescribed by law. This quantity corresponds to a depth of upwards of nine feet cutting through level ground.

The elementary prices upon which the estimates have been predicated, are a mean between the highest and lowest that have been given in the State.

The following is an abstract or summary of the detailed estimates contained in the book which has been deposited in your office. Next to the numbers which indicate the stations, are stated the numbers of Moore's report to which they correspond, in order to facilitate a reference to it. Besides the probable cost of each part of the work, every circumstance deemed of any importance, is mentioned in the following pages: for more minute particulars, I beg to refer to the books and maps in your possession.

The distance which has not been surveyed, has been estimated by a comparison to other sections.

ABSTRACT

FROM THE ESTIMATE FOR THE COMPLETION OF THE INDEPENDENT CANAL

FROM

COVINGTON

DOWN TO

MAIDEN'S ADVENTURE FALLS,

Divided into sections, each preceded by a description of the route.

1st SECTION.

From Covington *down to the* Rich Patch Mountain.

Distance by the Canal 16.06 miles.
Do. by the River 21.06 miles.

1*st Map.*—This section is fed by the water of Jackson's river, proposed to be raised eight feet by a dam built a short distance above the town of Covington, about 50 yards below a ravine, at which the canal would begin.

The route of the canal passes through the town of Covington, which is 251 miles (as the river runs) above the arch of the old canal near Richmond*. It keeps, at the beginning, along the margin of the river; it will be expedient to make it wide through the town, and I would suggest the propriety of reserving a sufficient space for this improvement, as otherwise buildings might be put up which might be an obstacle to the construction of a canal of such dimensions as the future trade of this growing town would probably require: I should consider a width of 200 feet the least space to be allotted for this purpose, in order to allow room on either side for the loading and unloading of boats and of the numerous waggons which may be expected to come to this place.

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* All the miles mentioned in the course of this report are numbered, from this point, to correspond with the maps of Ths. Moore.

The depth of cutting is at first 12 feet and diminishes gradually to the lower end of the town, where a considerable hollow may be converted into a basin. At a distance of 1¾ miles from the beginning, a bluff stops the excavation of the canal which must necessarily have part of its base in the river, but which ought to pass over the main cliff, the water being very deep at its base: this will require some deep and difficult cutting.

The canal soon below this cliff reaches a narrow ridge near widow Trustler's; it will be proper to cut through this ridge; the cut will be 17 chains in length and 41.68 feet at the highest point. A distance of three miles will thereby be saved, and some bad cliffs along the river avoided.

Immediately after the deep cut the line is lowered 35 feet by four locks: this is done in order to pass along cliffs just below at a suitable height above the river. The cliffs continue for 49.74 chains: they are composed of lime stone along the main hill and slate along its spur; the elevation of the line* is 18 feet above the river. This rocky hill side being very broken and its average slope as much as 38 degrees, it does not appear practicable to keep the canal at an elevation of about 60 feet up this steep declivity as proposed by Moore and Briggs. This is a little above the end of the 245th mile.

No obstructions occur then until the Pounding-mill run is crossed (end of the 243d mile): below this, a short cliff and rocky hill side, 32 chains in length, occasion a considerable expense. Thence to the Island Fording (241st mile) the ground is generally stony.

2d Map.—Very little below the Island Fording begins a formidable cliff 41 chains in length, which induced Ths. Moore to recommend taking the river at this place: but in his report it will be found that he passed along cliffs fully as formidable as this, without taking any particular notice of them. It is thought preferable to make the canal by embankment along it. This cliff contains the *Cave Rock* nearly opposite Peter Pince's, just above the 240th mile.

The next cliff is immediately above the end of the 238th mile: it is slaty and 28 chains long; it throws the base of the canal again in the river. Thence the level is kept along the base of the hills and crosses the low grounds to a point opposite Carnes's saw-mill, a quarter of a mile above the 237th mile tree. There a long range of cliffs on the north side, compel us to cross over to the south side of the river; Moore and Briggs proposed to do it in its own bed, but there appear to be many material objections to this plan. The site is bad for a dam; and there would be much difficulty to resume the canal, its entrance being necessarily at the mouth of a run which throws out occasionally an immense quantity of gravel; much drift-wood is also accumulated at this place, and the ground is so low and bad as to afford but little security to the works, without a considerable accession of expense. On all these accounts a stone aqueduct appears greatly preferable.

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* When the line or level is mentioned, it must always be understood to be the surface of the canal.

The map exhibits a survey made on the south side from the Island Fording to this point, to try another route which would save some distance: the survey proved this plan to be almost impracticable.

The first cliff below Carnes's is the *Alum Rock*, 38 chains in length: it is recommended to pass along it by embankment, leaving a road on the side of the hill, both on account of the necessity of preserving the present road, and also to intercept the disintegrated slate which crumbles and slides down the hill. This is near the end of the 236th mile. M. and B. deemed this cliff sufficiently difficult to take the river above it: I did not think it as bad as many other cliffs along which they built embankments.

The level along the cliff is at an average height of 17½ feet above the river; it is continued downwards and enables us to pass near the brow of a rocky bank, part of which must be trimmed down to the level of the canal. Immediately below this, and after a short deep cut, the canal reaches Major Wm. Haynes's house. There, instead of crossing the river, it is thought preferable to continue on the same side and thereby avoid the inconvenience of two successive crossings. This compels us to build in the river along the base of a very high hill for 74 chains, at the end of which the 231st mile tree is found. At about half a mile below this, it will again be necessary to trim down a high bank for about 19 chains; near and below which the level will be lowered by locks into the feeder of the 2d section at the gap through the Rich Patch mountain, and just above the end of the 230th mile.

ESTIMATE

OF THE

FIRST SECTION.

N. B. In the following statements, next to the numbers indicating the successive stations, the corresponding numbers of Moore's report are designated by an M, *wherever it has been practicable to identify them with tolerable certainty.*

1st Map—Distance 7.37 miles—Lockage 76.25 feet.

Stations.	*Distance in chains.*	*Observations.*	*Expense.*
From the beginning to station 20 (M. 21,)	140.75,	Ground good; canal 40 ft. wide through *Covington*; deep cutting for thirty-eight chains; 12 ft. deep at the beginning: for excavation,	9,593 97
		For a dam 223 feet long, 8 feet high,	2,750 00
		Embankment across the low ground on the right,	460 00
		Paving on the side of *Covington*,	375 00
		Guard-gates,	3,000 00
20—27, (M. 26,)	15.92,	Along a steep rocky hill side; passing over the main cliff: for excavation, embankment, puddling, walling, paving,	8,333 80
27—43, (M. 39,)	72.57,	Some deep cutting in places as much as 17 feet; also, some embankment and puddling,	10,991 16
43—56, (M. 44,)	16.92,	Across a sharp ridge, the excavation varying from 3.50 to 41.68 feet in depth,	13,017 50
		For six bridges within the preceding distance, one of which a road and town-bridge,	1,575 00
		The farm-bridges at 225 dollars, the town bridge 500 dollars.	
56—62, (M. 48,)	19.54,	35 feet of lockage in four locks,	31,500 00
		Basins between the locks,	1,710 70
Amount carried	forward,	- - - -	$ 83,307 13

Stations.	*Distance in chains.*	*Observations.*	*Expense.*
Amountbroug ht Fr.	forward,	- - - - -	$ 83,307 13
62 to 83,	49.74,	Along a rough and steep cliff; the first part lime stone; the lower extremity slate:* for embankment, puddling, paving,	34,549 80
		Being about 690 dollars a chain.	
83—97,	85.57,	Ground generally good; passing *Mallory's:* for excavation, one waste, one farm-bridge,	2,965 65
		One culvert,	1,200 00
		One lock of eight 25-100 feet lift,	7,590 00
97—77, (M. 77,)	34.72,	Good ground: for excavation and some embankment,	3,192 26
		Low culvert of 3 arches of 10 feet span each, over the *Pounding-Mill Run,*†	3,200 00
77—72, (M. 86,)	32.30,	Round a cliff and along a rocky hill side: excavation, embankment, puddling, paving,	7,708 20
		One lock of eight 25-100 feet lift,	7,590 00
72—59, (M. 110,)	103.20,	Along ground mostly stony and steep: excavation, a little puddling and paving,	10,453 54
		One lock of 8.25 feet lift,	7,590 00
59—52, (M. 114,)	18.77,	Very rocky ground: for excavtion and some puddling,	2,648 80
		Two locks of 8.25 feet lift each,	15,180 00
		This is just below the *Island Fording.*	
		The expense of the first map is, consequently, - - -	$ 187,175 38
		And with the addition of 10 per cent. for contingencies, &c. $ 205,893 00, which is at the rate of $ 27,937 per mile.	

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* Here in Moore's report a high level is recommended; the slope of the hill averaging 38° appeared too steep for this purpose; and, besides, to complete his object it would be necessary to cut about 30 feet deep through the spur, below which is altogether composed of slate. The small distance gained would not compensate for the great expense and difficulty of this plan.

† Whoever has seen this Creek, will be convinced of the impracticability of receiving it into the canal; and also, of its being unfit to be used as a feeder, as recommended in M's report. It is besides so near Covington, that it would be perfectly useless as such, even if it afforded any water in dry seasons.

2d Map—From the ISLAND FORDING *to the* RICH PATCH MOUNTAIN.

Distance 8.69 miles—Lockage 115.63 feet.

Stations.	*Distance in chains.*	*Observations.*	*Expense.*
Brought forward,	-	- - - - -	187,175 38
Fr. 52 to 35, (M. 9,)	41.38,	Here it is recommended in Moore's report, to take the river; but it is preferred to build along the cliffs: there is, except in few places, sufficient room without going into the river. The *Cave Rock* is the most difficult place of this portion: for embankment, puddling, walling and paving along a rocky hill side and cliffs,* - -	32,054 78
		Which is about $ 775 a chain.	
35—16, (M. 15,)	117.15,	Ground various, though mostly stony: for excavation, embankment and puddling, - - - - -	6,675 55
		One culvert of 12 feet span, -	3,000 00
		Three locks of 8.03 feet lift each,	22,320 00
16—10, (M. 25,)	38.23,	Along a slaty cliff 19.82 feet above the river at the lower extremity. This elevation is necessary for the aqueduct below: about 20 chains of this distance will require paving and puddling: for excavation, embankment, puddling and paving, - - - -	15,018 74
10—4,	28.05,	Along a hill side, excavation and waste,	4,462 00
4, to the aqueduct	15.50,	Embankment and puddling across the low grounds, - - - -	3,052 00
Across the river,	3.52,	For an aqueduct of stone composed of 4 arches of 50 feet span each, and 12 1-2 feet rise. The crown of the arch 18 1-2 feet above the river, which is 6 feet deep. Every part which is in contact with water, laid in hydraulic lime, and hydraulic grout spread over the extrados,† - - - - -	51,368 00
1—772,	100.47,	Ground not bad: excavation, some embankment at the aqueduct, puddling and waste, - - -	5,146 00
Amount carried	forward,	- - - -	$ 330,272 45

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* This expense does not much exceed the aggregate cost of a dam, guard lock, deep cutting, paving or walling, and other particulars incident to the beginning of every canal; to which must be added, the inconvenience of such a plan.

† It is above this point that Moore's report recommends the taking of the river and crossing it here in the pond of a dam 6 feet high: this plan would, I think, be attended with difficulties which render it quite impracticable. The expense of a stone aqueduct is considerable, but it is permanent and safe; and though I think wooden aqueducts objectionable, I would even prefer one to a dam; it would be safer, and probably not cost more than the dam and other works necessitated by the resuming of the canal.

Stations.	*Distance in chains.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	$ 330,272 45
From 1 to 772,	100.47,	One culvert of twelve feet span over the creek below the crossing place,	3,000 00
		Three locks of 8 feet lift each,	22,320 00
		Four bridges, - -	900 00
772—764,	37.99,	Along the Alum rock, which is passed on an average height of 17½ feet above the river: for embankment, puddling, paving, walling a waste and small culvert,* being about 660 dollars a chain.	22,403 00
764— 19,	89.65,	Through *Hansbarger's* farm, ground pretty good; below the farm the canal keeps along the edge of the river bank, where a little deep cutting will be necessary in places: there the ground is stony: for excavation, some embankment and puddling, one waste, and a farm bridge,	6,537 52
		One small culvert,	780 00
19— 26,	10.37,	Along the edge of a slaty bank, which must be trimmed down to the level of the canal, the width of which is reduced to 22 feet; it is lined inside with puddle supported by two small walls: for excavation, puddling, walling,	7,353 20
26— 33,	12.17,	Some difficult excavation,	1,202 52
		A small culvert,	780 00
33— 39,	24.95,	Deep cut through Wm. Haynes's farm in order to avoid the precipitous slope of a slaty cliff: the excavation is 20½ feet deep under the highest point: excavation, one farm-bridge,	9,246 50
39—717,	34.50,	Here the canal falls 40 feet by 5 locks: for lockage,	37,200 00
		For excavation, embankment and puddling of four basins,	2,752 00
Amount carried	forward,	- - - -	$ 444,747 19

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* Along this cliff, Moore's report recommends *to use the river, the water being raised by a dam just below about* 8 *feet*: the expense of passing along the base of this steep slaty hill side by embankment, will probably not exceed that of resuming the canal at the lower end. Besides which, the high level here preserved enables us to save a distance of nearly 1½ miles by cutting across two considerable bends; it also does away the necessity of building for a considerable distance in the river above Wm. Haynes's, (M. 6 to 19,) under very unfavorable circumstances. A low level, moreover, would keep the canal for some distance through gravel and a light alluvial soil, ill-calculated to make the bank with. Along the base of the Alum Rock, there is a much travelled road, which should be preserved; this circumstance combines with the crumbling nature of the cliff, to advise the plan adopted. The canal is reduced to 22 feet width by means of two small inside walls raised up to the water line: the lower bank is made only 6 feet thick and carefully paved outside. Towards the hill an embankment 12 feet wide is reserved for the road; it should be made to incline towards the hill, so as to stop the falling disintegrated slate. A culvert at the lower end will convey off under the canal the rain-water, together with most, if not the whole, of the light slate dust. Both banks and the bottom of the canal should be well and thickly puddled.

Stations.	*Distances in 4 pol. chs*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	$ 444,747 19
From 717 to 691,	74.07,	The locks lower the level to a height of 13.60 above the river; in the bed of which, the base of the bank will be for the whole distance: the level is 24.08 above the river at the lower end: the water is in general shallow, except at the lower extremity, where it is 4 feet deep The high and steep hill, along the foot of which the canal will be built, will afford an abundance of earth and good stone for paving. for embankment some excavation, puddling and paving.	45,244 70
		Which is at the rate of 610 dollars per chain.	
691—683,	31.66,	Stony ground: for excavation, some puddling and walling,	2,130 46
683—677,	19.56,	Along the edge of a high and steep bank. The bank must be trimmed down to the shape of the canal reduced to a width of 22 feet lined with puddle, and with two small walls inside: the section cut away varies from 21 to 103 square yards: for excavation, puddling and walling,	9,959 10
		Which is nearly 500 dollars a running chain.	
		A culvert, with a waste on the upper side	2,100 00
677—671,	22.63,	Which complete the 1st section; ground good at first, but rocky towards the lower end: for excavation,	890 22
		27.54 feet of lockage in 4 locks,	27,520 00
		Total expense of this 1st section,	$ 532,591 67

And with the addition of 10 per cent. for contingencies, &c. $ 585,850,
Which is about - - $ 36,478 per mile of the canal,
And - - 27,818 per mile of the river.

Several miles having been saved by short cuts, by which some extra expense has been incurred, it appears proper to compare the expense of the canal with the length it would have if it followed the river.

The expense of the 2d Map is 379,957 dollars.

Near Wm. Haynes's, Moore and Briggs crossed the river and resumed the canal on the left side, by raising the water 10 feet: they crossed back again to the right side, 1¾ miles below, at the Rich-Patch Gap Ford; this was done apparently to avoid the bad ground at the end of the above section. But I did not consider the difficulty so great as to justify the expense and inconvenience of two crossings in so short a distance; nor could much be gained in point of ground; for, the bank on the left side is very high and would occasion a considerable depth of cutting: some cliffs would also be in the way at the beginning, and *Mill Creek*, which is a considerable stream, would require an expensive aqueduct; so that this plan would be fully as expensive as that here adopted.

Moore and Briggs used the river five times between Covington and this point. It does not appear that a canal, so located, though much more expensive, could have answered a better purpose than a mere lock and dam navigation, since it would have been liable to the same causes of interruption.

SECOND SECTION.

FROM THE

RICH PATCH MOUNTAIN

TO THE

NORTH BRANCH OF JAMES RIVER.

Distance by the Canal 53.99 miles.
Do. by the River 60.50 miles.

3d *Map.*—This section begins at the *Gap Fording* just above the gap where Jackson's river breaks through the Rich Patch mountain, and a quarter of a mile above the 230th mile tree. There being no tributary stream of any importance for about 36 miles, it is expedient to take in a new supply of water at this place, than which no site could be more favorable; there being a deep pool of water just above the ford, a natural ditch immediately below it, and the river falling rapidly; so that no deep cutting will be required, and without the assistance of a dam the canal will soon be out of the reach of the river. Thence to the North Branch the supply of water will be kept up by several never-failing streams.

The canal, therefore, begins just above the ford, and then continues along the margin of Jackson's river at the foot of the Rich Patch mountain for upwards of a mile; this distance is very rocky; at the end of it, the line traverses Kayser's farm and is carried through ground generally good along the base of the hills to near the 225th mile tree, where another formidable slaty cliff, also called *Alum Rock,* requires the canal to be raised by embankment for 45 chains, along the edge of the river and partly in it: this is preferred to the plan of Moore and Briggs, who took the river, just above the cliff. This is two miles below the mouth of the Cow Pasture river. Thence through Pitzer's and Wood's farms, the route of the canal continues over variable ground until opposite Wood's island where it passes along a very steep bank, much broken by deep gullies, which make this place both difficult and expensive.

Immediately below Wood's island, at the end of the 220th mile, the left shore becoming by far preferable, an aqueduct must be thrown across the river; this is rendered indispensable by the great height of the bank on the north side. It was also the plan of Moore and Briggs.

4th Map.—After having crossed over to the north side of James river, the ground is favorable for excavation to the lower end of Poage's farm, just below the 218th mile tree, where a rocky hill-side and cliff 17 chains long, places the canal in the river; then, after a long stretch of good ground, *Sinking creek* and *Long's entry-run* (now called Mill creek,) are successively crossed; near the end of the 216th mile, Mill creek will afford a good supply of water.

Half a mile above the end of the 213th mile, there is another rugged hill 49 chains long, where there is now barely room along the margin of the river for the Covington road; this is also the case at the next cliff below, which is at the gap of the North mountain, (212th mile,) and is very rocky for 32 chains: at these two cliffs, as well as at that below Major Poage's farm, some additional expense will be incurred to preserve the road.

Thence, though somewhat stony, the ground is not rocky until about half a mile below the 211th mile tree, where, for 33 chains, the canal will present much difficulty, having to pass along a very rough cliff, whose base is frequently in the river. The cliff ends near the head of Peale's island, (210th mile,) which is a good site for a feeder if it was needed.

5th Map.—The distance contained in this map is one of the most difficult of the line; obstacles present themselves at almost every step; the ground is generally bad, creeks and deep ravines occur frequently, and cliffs are very common. Half a mile below Peale's island and in sight of the preceding cliffs, another still more formidable range of them, 37 chains in length, obstructs the route of the canal: numerous high and projecting promontories compel the embankment at their base, to be built in very deep water. It ends at the 209th mile tree. The next cliff is perfectly vertical to a height of 80 feet: its base is also in deep water: it is 19½ chains long, and terminates at the 207th mile tree opposite Mallory's. Half a mile below this comes the very rugged range of cliffs known by the name of the *De-*

vil's brick-yard, which is 38 chains in length. At the end of the 204th mile, another smooth and high rock places again the canal in the river; there the cliffs continue almost without interruption for 1¾ mile: part of them may be avoided, and nearly 3 miles saved in distance, by opening a tunnel 606 yards in length, through the narrow neck of a long bend. The tunnel would open to the light again at the 200th mile's end near Maize's, next to which the ground is again rough, and ends in another cliff 26 chains in length near the 199th mile tree; along this the water is 4 feet deep. A less confined ground is then traversed; but, at the 197th mile tree, another high cliff 24 chains in length occurs, and will occasion a considerable expense. The last cliffs contained in this map, and in the way of the canal, are at the end of the 196th mile; they are 23 chains in length.

6th Map.—The beginning of this map presents some good ground. At the end of the 193d mile, nearly opposite the mouth of Looney's creek the ground is rocky and broken. At the 191st mile tree, just above Pattonsburg, the road to Covington occupies the ground over which the canal must necessarily pass. Just below Pattonsburg, *Purgatory creek* must be crossed by an aqueduct and some water brought from it into the canal to renew the supply. Half a mile below this, a cliff 32 chains long begins. There is another one 1½ mile farther at the 189th mile tree, which is 47 chains in length; the rest of the ground is good down to the 186th mile tree, just above Shepherd's island.

There it is thought advisable to cross the river on an aqueduct. Though the river must be re-crossed at Rocky Point mill, only five miles below, difficulties almost insurmountable prevent the continuation of the canal on the north side: There is in that distance three very rocky miles, and, among others, two high jutting cliffs against which the water beats with great violence, and round which the canal could not pass without much difficulty and expense. The upper one is at Shepherd's island: the second and most formidable, at a place called *Mitchell's gulph;* the water is so deep at its base, and it projects so much, that it would probably have to be tunnelled through. To cross at Shepherd's island upon a low level in the pond of a dam 4 feet high, as recommended by Moore and Briggs, is so utterly impracticable, that the most material objections to this plan must very likely have escaped their notice: they make no mention of *Jenning's creek,* under the mouth of which the entrance of the canal would find itself;

this is probably the most troublesome creek that discharges itself into James river: the great quantity of gravel ejected by it, the enormous piles of drift-wood accumulated near its mouth, and which probably may have prevented their perceiving it, can leave no doubt that the entrance of the canal would be constantly obstructed and choked up. The level of the aqueduct is 30 feet above James river; this elevation enables us by a short deep cut to save a distance of about 2½ miles.

7th Map.—A short distance after having crossed the *river*, an aqueduct must be thrown over Jenning's creek; it will be about 16 feet above it, and will be accompanied by much embankment, the whole of this ground being very low. The embankment will be 27 chains in length, but will not be very expensive, as it must proceed from the deep cut made through the hill, just beyond the creek; this, if deemed necessary, may easily be made to help in feeding the canal, for which purpose, only a very short race will be requisite, the fall of the creek being very rapid. The narrow ridge beyond Jenning's creek is cut through to a maximum depth of 30½ feet. The end of the deep cut is a little above the 183d mile tree; there the canal is lowered 25½ feet, and continues through good ground down to the next crossing place, half a mile below *Rocky Point mill.*

8th Map.—Rocky Point mill is at the end of the 181st mile; the river is proposed to be crossed upon an aqueduct. Here this plan is not indispensable: a dam might be raised at a ledge some distance below, and the canal resumed on the north side without much difficulty, though some drift-wood accumulates at this place. This plan would certainly be cheaper than a stone aqueduct, but the difference would not be over what ought to be reasonably allowed for the superior convenience and permanency of the mode of crossing here recommended. There being no deficiency of water along the whole of this section, which may be plentifully supplied by lateral streams, a feeder here would be of no advantage, especially as it is not more than 9 miles from the North Branch; whereas an aqueduct may be made with a tow-path which would admit of light carriages passing over it. The river being crossed here by a much travelled road, the tolls that might be received would lighten the expense of the aqueduct: heavy waggons might pass the aqueduct, in a flat boat kept in the canal for the purpose. I would even prefer a wooden aqueduct here to crossing in the pond of a dam.

Thence no material difficulty occurs as far as the North Branch. A rocky hill-side 21 chains in length, along the river at Gilmore's falls, and a little above the 177th mile tree; another 43.77 chs. long, just above Crawford's creek and the 173d mile, and a short one only 16 chains long at the Quarry falls, just below the 172d mile tree, are the only cliffs in the way. The greatest expense of this map will result from the water courses to be crossed, the most considerable of which are *Cedar creek*, which flows under the Natural Bridge and turns Gilmore's mill, and *Crawford's creek*. This map and the second section end ¼ of a mile below the 170th mile tree, at the North Branch, which must be crossed opposite the entrance of the canal through the Blue Ridge, in the pond of the dam raised at the Witch falls: a tow-bridge does not appear indispensable for this purpose, as there will very seldom be a strong current in the North Branch.

ESTIMATE

OF THE

SECOND SECTION.

3d Map—From the Rich Patch Mountain *to the lower end of* Wood's Island.

Distance by the Canal 9.42 miles.—Lockage 48 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
From 0 to 658,	67.22,	Through the gap of the Rich Patch Mountain, along the rocky base of the mountain and close to the edge of the river: the water is taken out of a deep pond just above the head of the *Gap Fording* falls: for embankment, puddling, paving and walling,	$ 26,552 90
		For guard-gates,	3,000 00
658—643,	60.80,	Continuation of the gap: excavation, embankment, puddling, some paving,	11,311 00
		Which makes the expense through this rocky gap $40,863 90, or nearly 320 dollars per chain.	
643—. 5,	42.53,	Passing along the base of the hill behind Kayser's farm: excavation, embankment, puddling,	4,621 80
5— 12,	43.87,	To avoid a low slaty cliff and a marsh at its base, and also, to save distance, a short cut is made through the table land above it; the cutting is 8.68 feet deep at first, and decreases gradually to station 12; ground mostly good: for excavation,	3,140 50
12— 25,*	47.38,	Good ground: for excavation, 1 bridge,	1,781 80
		One lock of 8 feet lift,	7,440 00
Amount carried	forward,	- - - - -	$ 57,848 00

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* Station 25 is opposite the mouth of the Cow Pasture river: an exact estimate to go wn to the river at that point. cannot be concluded from the above, since the route uld be different; nor is it very material, as the confluence of Jackson's river and Cow Pasture is not an eligible point to take the river at, there being a brisk fall l little water at that place.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought Fr.	forward,	- - - - - -	57,848 00
25 to 596,	144.00,	Ground mostly good; some deep cutting 14 feet at one place, 7 feet at another: excavation, two wastes,	6,776 60
		One culvert near the Alum Rock of 10 feet span,	2,000 00
		4 locks of 8 feet lift each,	29,760 00
596—594* (M. 46,)	45.36,	Along a high and steep cliff known by the name of the *Alum Rock*. The base of the canal must be in the river: the level is 16.35 feet above it. The canal is contained between two banks to prevent leakage through the fissures of the rocks. The river averages 4 feet deep: for embankment, puddling, paving,	30,571 80
		Which is about 680 dollars a chain,†	
594—29,	237.71,	Ground mostly good: for excavation, a little embankment and puddling, four wastes, 2 farm-bridges,	11,865 25
		2 small culverts,	1,780 00
		One lock of 8 feet lift,	7,440 00
29—540,	58.56,	Ground much intersected by deep ravines: for excavation, embankment, puddling, one waste,	6,765 70
		4 culverts,	3,500 00
540—539, (M. 36,)	5.90,	At the lower end of Wood's Island, across James river, which is there 196 feet wide; it is passed over on an aqueduct, which, owing to the great elevation of the banks and other local circumstances, is the only advisable plan: for embankment, puddling, some walling and paving next to the abutment of the aqueduct,	3,875 70
Amount carried	forward,	- - - -	$ 162,183 05

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* Above this point the numbers of Moore's report could not be stated, the route he pursued being entirely different; instead of keeping along the base of the hills, he passed along the margin of the river, which is very irregular; along a hill the level may always be traced, but through flat land, the ground often sinks below, or rises above the level, and thereby produces an extra expense for embankment or deep cutting, which generally more than counterbalances the advantage of opening the canal through ground somewhat more easy of excavation.

† The plan of Moore and Briggs was to use the river along the cliff, and to resume the canal immediately below, with the assistance of two dams, and then *either pass down Pitzer's race, or on ground to the right, the cutting averaging 3 feet.* No place could be more unfavorable for this plan: much gravel is brought and deposited here by the river; the foundations for dams and guard-locks are bad; it would not be expedient to occupy the mill-race, and out of it *much deep cutting*, (about 16 feet,) would be requisite, as will appear from the profiles in the 7th field-book. This circumstance, together with the expense of the dams, guard-lock, &c. would swell the expense to nearly as much as that of building in the river along the base of the cliff, without procuring commensurate advantages.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	162,183 05
		For an aqueduct of masonry; the water line 32.92 feet above low water; three arches of 60 feet span and 20 feet rise each. The river is nearly 5 feet deep,	52,230 00
		Expense of the third Map,	$ 214,413 05

And with an addition of 10 per cent. for superintendence, contingencies, &c. - - - $ 235.854 00

4th *Map.—Extending down to* Pretty Creek *below* Peal's Island.

Distance 10.50 miles—Lockage 69 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
Fr. 539 to *e*, (M. 26,)	202.29,	Passing through Wammuck's and Poage's farms ground generally good: for excavation, three farm-bridges,	9,019 00
		For 29 feet lockage in 4 equal locks,	28,130 00
e—508, (M. 30,)	17.11,	At *e* we come to a rocky hill side which soon becomes a perpendicular cliff; it is passed 19.67 feet above low water in the river: for excavation, embankment, puddling, walling and paving,	11,486 10
		Including an extra expense of 800 dollars to retain the present road.	
		A culvert with a waste on the upper side,	2,400 00
508—482,	105.46,	Ground good for excavation, some of it requiring puddling: excavation, puddling,	5,276 70
Amount carried	forward,	- - - - -	$ 270,724 85

Stations.	*Distances in 4 pol chs.*	*Observations.*	*Expense.*
Amount brought Fr.	forward,	- - - -	270,724 85
482 to 481,	9.03,	Crossing *Sinking creek,*[*] considerable embankment, puddling, paving and double culvert, - -	7,395 50
		The level of the canal is 14 1-4 feet above the creek each arch of 12 feet span and 4 feet rise.	
481—480,	8.00,	Across a narrow tongue of land, where the cutting is as much as 10 feet in places :† excavation,	795 60
480—479, (M. 55,)	11.13,	Crossing *Long's entry-run*, also known by the name of *Mill creek*: by a double culvert on a level 16.80 feet above the creek: for embankment, puddling and culvert, - -	7,176 70
		For a feeder 700 yards long to be taken out of this creek, including dam, gates, waste-weir, - - -	1,600 00
479—467, (M. 66,)	89.44,	Very good ground: excavation,	2,623 10
		4 bridges from the last cliff to here,	1,000 00
		2 locks of 8 feet lift each, -	14,880 00
467—453, (M. 77,)	82.77,	Crossing M'Clung's and Dysher's farms occasionally along a steep hill side :‡ excavation, one bridge, one waste,	5,639 80
453—443,	48.71,	Along a steep stony hill side: excavation, puddling,	8,194 10
		Additional, to preserve the road to Covington,	1,425 00
443—433,	53.57,	Through Sheetz's farm, ground variable: for excavation,	2,565 40
Amount carried	forward,	- - - -	$ 323,920 05

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[*] *Sinking creek* is so named from its losing itself under a bed of gravel above the point where the line of the canal must cross it, so that during the summer as the road is perfectly dry through it, at this place, it probably escaped the notice of Mr. Moore, who, as appears from his statement of distances, gives the name of Sinking creek to Long's entry-run, a few chains below.

† It is difficult to reconcile here a cutting of 3 feet, as stated in Moore's report, page 55, with the small expense of embankment across the creeks, which would seem to indicate a low level. Although we have sunk the level as much as possible across this table land, in order that the deep cutting might furnish part of the embankments, which are themselves thereby lowered; still their expense thus lessened, exceeds considerably, independently of the culverts, $ 800, at which they are estimated in Moore's report.

‡ It is said of this place in Moore's report, "*along a steep hill side, where any cutting may be had, 2 feet will be about the average.*" There is on a slope a quantity of cutting, which will just make the embankment, this is the *least possible cutting;* the hill side here slopes as much as 24 degrees in places, for which the least cutting is 32 cubic yards per running yard: whereas 2 feet cutting will furnish only 5 cubic yards, which would not go far towards making the bank of the canal; on such a slope it would hardly suffice to make a road 18 feet wide. The idea so often repeated in that report that the cutting can be *chosen* is certainly very singular: errors of location may increase the excavation considerably; but it is not possible *to choose the cutting* so as to reduce it below the minimum which corresponds to the slope of the ground.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought Fr.	forward,	- - - - - -	323,920 05
		One lock of 8 feet lift,	7,440 00
433 to 424,	32.34,	Through the gap of the *North mountain*, very rocky; part of the projecting rock, near the cave called the *Rat hole*, must be blasted away to allow room both for the canal and Covington road; this circumstance adds to the expense of the canal through this gap; the line is 24.10 feet above the river: for excavation mostly of rock, embankment, puddling,*	10,942 20
424—412, (M. 109, is 25 chs. before.)	76.37,	Passing by Dysher's; ground a little stony: for excavation, 3 bridges, 1 waste,	5,179 30
412—405, (M. 119,)†	29.74,	Along stony ground: in this distance 2 creeks are crossed: for excavation, some embankment, and puddling,	1,277 40
		2 culverts, one of 12 the other 6 ft. span,	3,700 00
		One of these creeks is pretty abundant, and might be brought into the canal by a short race, if judged necessary.	
		2 locks of eight feet lift each,	14,880 00
405—401,	32.76,	Here begins a steep rocky hill side, which soon becomes a solid cliff, the shape of which is very variable, as is exhibited by the cross sections of the field book, (7th). It is composed of lime stone. The line along it is 16.08 feet above the river, which is from 3 to 4 feet deep, and even 6 feet at one place: in this distance two low projecting cliffs must be blasted off:‡ for embankment, puddling, blasting, paving,	17,880 70
		Which is about 545 dollars a chain.	
		Station 401, is near the head of Peal's Island, where there is a good site for taking in a new feeder, if it was thought necessary. A dam 9 feet high would raise the river to the level at which we pass the cliffs below. It is presumed, however, that this new supply will not be wanted.	
Amount carried	forward	- - - - -	$ 385,219 65

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* In Moore's report a low wall is mentioned; this, on our level, is not necessary.

† This number in Moore's report begins a section of upwards of three miles, estimated at 3 feet cutting, at 18 cents per cubic yard.

‡ In Moore's report, page 56, this cliff makes part of the section of three miles represented as a rough stony hill side. It is difficult to conceive how an average depth of cutting of 3 feet, which furnishes about 8 cubic yards per running yard, could be supposed sufficient to make a canal here; it would hardly make a road along so precipitous a slope as this, which averages 26°; nay, it would hardly raise the embankment above the surface of the river.

Stations.	*Distances in 4 pol chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	385,219 65
Fr. 401 to 391,	15.94,	Along a rough hill side, mostly in the ravine of a creek, which heads 7.50 chains after 401 : for excavation, some embankment and puddling, one bridge,	4,844 40
		One culvert,	2,000 00
		Total amount,	$ 392,064 05

The expense of the 4th map is consequently $ 177,651 00
And with the addition of 10 per cent. for contingencies, &c. 195,416 00

5TH MAP.

Distance 10.75 miles by the canal—Lockage 61 feet.

The canal in this Map is about 3 miles shorter than the river.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
Fr. 391 to 382,	38.88,	Ground stony : for excavation,	2,099 35
		Culvert over *Pretty run*, -	2,400 00
		One lock of 8 feet lift, - -	7,440 00
382—380,	37.12,	Here a cliff begins, which is passed at an average elevation of 17 feet; it is very rugged. Several promontories of rock with deep water at their base, (in places as deep as 8 feet,) are in the way of the canal; between them the hills recede very considerably from a direct course. The canal for the most part must be made by embankment in the river:* for excavation, embankment, puddling, paving, a waste,	21,965 00
		Making the expense 570 dollars per chain.	
Amount carried	forward,	- - - - - -	$ 425,968 40

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* This is included in the section of three miles stated in Moore's report, page 56, at 3 feet cutting, which is equal to about 8 cubic yards per running yard; and yet the water in places is so deep that the section of the canal is as much as 166 square yards: the projecting cliffs are vertical to an inaccessible height. A wall is indeed mentioned at $ 100 a chain; but this sum would hardly raise the wall and embankment out of the water.

Stations.	*Distances in 4 pol chs*	*Observations.*	*Expense.*
Amount brought Fr.	forward,	- - - - -	425,968 40
380 to 349,	141.21,	Passing before the mouth of the *Catawba*, great variety of ground, though principally stony. the last [illegible]0 chains are very much so: for excavation, some of it 6 feet deep, embankment, puddling, 2 wastes, 1 bridge,	10,405 80
		One lock of 8 feet lift,	7,440 00
349—342, (M. 168,)	19.42,	This is opposite Mallory's; the canal passes at an elevation of 20.29 feet along the most expensive bluff as yet encountered; it presents a vertical face to a height which measures 80 feet; the water is from 3 to 4 feet deep:* for embankment, puddling, paving,	19,277 90
		Being nearly 990 dollars a chain.	
342—337,	19.05,	Though the cliff was passed on a high level, the bank is here so high that the cutting will be as much as 12 feet deep for some distance; but, as the whole of this excavation will be employed in raising the canal along the cliff, which has been estimated accordingly, nothing is set down here for excavation,	000 00
337—333,	23.52,	Ground a little stony: deep cutting,	948 40
(M. 169,)		One lock of 8 feet lift,	7,440 00
332—329,	37.91,	Along a very irregular lime stone cliff known by the name of the *Devil's Brick-yard*, which is passed at an elevation of 17.81 feet at the beginning, and 20.15 at the lower end, above the river. The stone obtained from the cliff will answer for paving, but would not for walling:† embankment, puddling, paving,	20,912 90
		Being about 555 dollars per chain.	
329—302, (28 chs. after M. 195,)	131.77,	Passing through Reid's farm; ground very stony at first; very good through the farm. After Reid's house a fine constant stream is crossed, as also another creek called *Spring Run*, just at the end of this distance, both of them by culverts: they may, besides be	
Amount carried	forward,	- - - - -	$ 492,393 40

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* This cliff ends the section of 3 miles already mentioned in the preceding notes; the embankment necessarily built in the river, averages 188 cubic yards per running yard; while this smooth vertical cliff and the preceding ones, are lumped at 3 feet cutting at the average price of 18 cents, it is a natural matter of surprise, that in the same report, the cliffs along Jackson's river and just below, should have been deemed so formidable as to require the river to be used so frequently, though they are less steep and the water generally shallow at their base.

† The estimate of Moore's report, along this cliff, is also 3 feet cutting at 18 cents per cubic yard.

Stations.	*Distances in 4 pol chs*	*Observations.*	*Expense.*
Amount brought Fr.	forward,	- - - - - -	492,393 40
		brought into the canal as feeders by short races; this plan is preferred to taking them in by means of dams. They afford very clear water: for excavation, some embankment, puddling, one waste and one bridge,	8,829 90
		Two culverts and short races,	5,700 00
		One lock of 8 feet lift,	7,440 00
302 to 297,	47.12,	Immediately after crossing Spring Run, a very rugged lime stone cliff begins, along which the level is 19.79 feet above the river: the water being 10 feet deep in places, a wall must be built for 25 chains, in order to keep the bank of the canal out of the river; this is also a reason for passing this sloping cliff on a high level: for embankment, puddling, walling, paving, one waste,*	29,707 80
		Which is about 630 dollars a chain.	
297—287,	35.08,	After 6 chains we come to a kind of island called the *Grassy Bottom*, which is cut off from the main shore only at high water. After having surveyed the whole of this ground, it was concluded that the most eligible plan would be, to overflow the channel between this island and the hill, by raising an embankment 22 feet higher than the river at each end of it; into the basin thus formed, the canal is lowered by a lock; the island is higher than the canal, but some parts of it may have to be raised by embankment, in order to prevent the encroachments of freshets. This plan is the cheapest; but if the basin should leak under the island, it would then be necessary to conduct the canal over the embankments and through the island; which would be still better than to keep along the main shore, which is very rugged and would not allow of an easy turn at the entrance of the tunnel: for some excavation, embankment, puddling, paving,	3,111 40
		One lock of 8 feet lift,	7,440 00
Amount carried	forward,	- - - - - - -	$ 554,622 50

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* In Moore's report, page 57, this range of cliffs, which in places are hard smooth ledges, is represented as requiring *a cutting that may be averaged at 3 feet, and the cost of excavation at 16 cents per cubic yard.*

Stations.	Distances in 4 pol. chs.	Observations.	Expense.
Amount brought	forward,	- - - -	554,622 50
Fr. 287 to 242,	36.30,	Between these two points the distance as the river runs is nearly 3½ miles, 3-4 of a mile of which are along cliffs, so that it is deemed expedient to avoid this circuitous route by opening a *tunnel.* Some uncertainty always exists as to the probable expense of these subterraneous works; if every circumstance should prove favorable, the tunnel might be cheaper than here stated, but it might also be higher; I have adopted a medium estimate. Some very deep sinks, such as are often seen in lime stone countries, exist in this hill, and may greatly diminish the expense of the shafts. The tunnel itself would be 606 yards long: for deep excavation at both ends,	14,531 40
		For the tunnel,	36,360 00
		This expense, which divided into 3 1-2 miles, would be at the rate of 14,600 dollars per mile. would probably not exceed much the cost of the canal if it went round.	
242—213, (M. 256 is 57 chs. before this.)	108.69,	Through Maize's farm, ground stony and broken; several runs and ravines are crossed: for excavation. embankment, puddling, paving, and also, turning a road and making 2 bridges and 2 wastes,	10,108 80
		2 culverts, (one of them over *Roaring Run,*)	2,120 00
		3 locks of 8 feet lift each,	22,320 00
213—210, (M. 270,)	26.41,	Along a rocky hill side and projecting cliffs; water 4 feet deep; they are passed on a level 14½ feet high at the beginning, and 16.22 at their lower end. This is opposite Ritchie's farm:* for embankment, puddling, paving and some excavation,	12,054 00
		Which is nearly 460 dollars per chain.	
210—197, (near M. 284,)	76.73,	Through Leip's farm; ground generally stony; the cutting varies from 3 to 9 feet in depth: for excavation and some puddling and bridge,	5,860 30
		Embankment and puddling *at Leip's Creek,*†	1,408 80
Amount carried	forward,	- - - -	$ 659,385 80

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* This in Moore's report, page 57, is also 3 *feet cutting at* 18 *cents.*

† This and all the runs in this quarter are crossed at an expense estimated in Moore's report at 100 dollars each. Though our level is low, as is indicated by the great quantity of deep cutting it requires, the embankment alone, across Leip's run, will amount to no less than 1,400 dollars, as stated above. The other runs are likewise expensive to cross, as they are all at the bottom of deep ravines.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	659,385 80
		Culvert of 12 feet span,	3,000 00
From 197 to 185,	36.96,	Good ground; some of the cutting is 9 feet deep. In this distance *Spangler's Creek* is crossed: for excavation,	982 80
		Embankment and culvert of 10 feet span,	2,761 20
185—182,	23.96,	Here begins a steep rocky hill side, which, after 10 chains becomes a solid, smooth cliff, along which the level is 26 feet above the river, which at the beginning is 4 feet deep. The high level kept here is expedient: for embankment, some excavation, puddling, paving,*	16,384 70
		Which is about 682 dollars a chain.	
182 — 163, M. (303,)	66.07,	The ground continues rough and stony, and in places rocky: the high level preserved along the cliff just above, passes along the slope of this rough hill side to advantage: for excavation, embankment, puddling,	14,530 40
		A culvert over Cross's creek,	1,280 00
Amount carried,	forward,	Total amount,	$ 698,324 90

The expense of the fifth Map is, therefore, - $ 306,260 85
Or, with an addition of 10 per cent. for contingencies, &c. 336,887 00

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* This in Moore's report, page 27-28, is again 3 *feet cutting at* 18 *cents.*

Amount brought forward, . . . 698,324 90

6th Map.—Extending down to SHEPHERD'S ISLAND.

Distance by the canal 8.92 miles.
Lockage - 40.45 feet.

The canal in this Map is about one mile shorter than the river.

Stations.	*Distances in 4 pol chs.*	*Observations.*	
From 163 to 126,	186.72,	Ground various; good through Charles Penn's farm; stony at the lower end: for excavation, some embankment and puddling, one bridge, one waste,	10,144 30
		One culvert,	1,460 00
		One lock of eight feet lift,	7,440 00
126—100,	117.55,	Very rocky at first; then some deep cutting as much as 11 feet at the deepest, but through good ground. Towards the end the ground becomes stony: for excavation, some puddling, one bridge,	7,723 70
		Two locks of 8 feet lift,	14,880 00
100 — 90, (M. 347,)	30.84,	Passing along a steep hill side, part of which has been cut out for the road from Pattonsburg up the river; the necessity of preserving this road will occasion some extra expense. Station 90 is on the east edge of the road through *Pattonsburg* exactly at the corner of the yard of the tavern. The level along the river is 24.80 ft. above it: for excavation, embankment, puddling, paving, a waste and a road-bridge in Pattonsburg,	4,912 60
90—78,	34.45,	Through the town of Pattonsburg and over *Purgatory creek.* The ground is generally good: for excavation and embankment,	1,633 80
		For an aqueduct of 24 feet span over *Purgatory Creek,*	6,000 00
		Probable expense of bringing a supply of water from the pond above the mill, which is 7 feet above our level,	500 00
		One lock of 8.45 feet lift,	7,731 75
78 — 68, (M. 362,)	31.82,	Along a very rugged lime stone cliff, 19 feet above the river; for embankment, puddling, some excavation, walling,	13,512 50
		Making the expense about 425 dollars, a chain,*	
Amount carried	forward,	. . . . . .	$ 774,263 55

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* Though this cliff is less considerable than most of the cliffs above, the expense pass it is rated higher in Moore's report, than at all the others; in general the cost is as underrated as that report proceeds downwards.

Stations.	*Distances in 4 pol chs*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	774,263 55
From 68 to 46 (M. 376,)	103.36,	Through ground generally good; for excavation, a little puddling, one bridge, two wastes.	5,067 80
		One lock of 8 feet lift,	7,440 00
46 — 30, (M. 382,)	47.63,	Along a rocky and cliffy slope, all limestone. The level along it is 23 feet above the river; this elevation is required by the necessity of obtaining a sufficient height for the aqueduct below: for embankment, puddling and paving,	34,825 20
30— 4,	138.31,	Over good ground, except just at the end: for excavation, one waste,	6,935 20
4 — 1, (M. 400,)	6.75,	Embankment and puddling across the low ground,	3,808 20
1 — 96,	5.42,	Here the river is 357 feet wide, and about 4 feet deep; it is crossed thirty feet above its level by an aqueduct composed of 6 arches of 50 feet span and 16 2-3 feet rise, resting on piers 8 feet thick, &c. For the aqueduct,	74,900 00
		Total amount,	$ 907,239 95

The expense of the sixth Map is, therefore, - $ 208,915 05
And with the addition of 10 per cent. for contingencies, &c. 229,807 00

Amount brought forward, - - - 907,239 95

7th Map—From SHEPHERD'S ISLAND *to* ROCKY POINT MILL.

Distance by the canal 3.50 miles.
Lockage - 34 feet.

The canal in this Map is about 2½ miles shorter than the river.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
		- - - - -	
Fr. the aqueduct to station 3,	22.64,	For embankment and puddling at the south abutment of the aqueduct, and excavation,	2,226 30
3—7,	27.00,	Embankment and puddling across the low valley of *Jenning's Creek,* and one road bridge	4,245 00
		N. B. The embankment will be furnished by the deep cutting beyond this point; the expense here stated is accordingly only for transportation, unloading and spreading.	
		For a double culvert over the creek,*	5,800 00
Amount carried	forward,	- - - - -	$ 919,511 25

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* This creek is so obstructed by the drift-wood accumulated at its mouth in enormous piles, and which covers, probably, a surface of twelve acres. that its existence may not have been suspected by Moore and Briggs, who make no mention of it: it nevertheless forms an insuperable objection to their plan of *crossing the river by a dam 4 feet high at the head of Shepherd's Island.* The entrance of the canal thus placed at the outlet of the creek which discharges a great quantity of large gravel and apparently much drift wood, could not be kept open, even if the timber floating down James river did not accumulate at this place: the low level recommended in that report would also be impeded by low cliffs along the margin of the river.

The elevation of the aqueduct, which enables us to cut through a narrow hill beyond Jenning's creek, and thereby save 2 1-2 miles, allows also to cross this creek at a height of about 16 feet above it, which is deemed sufficient. The cheapness of the culvert is produced by the probability that the materials to build it will chiefly be obtained from the deep cut already mentioned.

To keep on the north side of the river is forbidden by the ruggedness of that shore: a tunnel through the cliff at *Mitchell's Gulph* would, in all probability, be indispensable, and great difficulty would be encountered at a deep ravine just below it, and at which the cliff terminates abruptly; besides these causes of great expense, and the 3 miles of cliffs mentioned in the general description of this section, four culverts of considerable size must be built on that side, almost in the bed of the river. If against these difficulties and consequent expenses, we set the probable cost of the canal on the south side, with a proper allowance for the permanency and great public convenience of two aqueducts, as well as the saving of two and a half miles in the distance, there can remain no doubt of the expediency of the plan adopted here: it might even be rendered cheaper than that of continuing along the north bank, by building the aqueducts, at Shepherd's Island and below Rocky Point Mill, of wood. They would probably cost together $ 65,000, which, added to $ 80,105, the esti-

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	919,511 25
		The creek might easily be made to assist the supply, there being much fall just above; the race for this purpose would be very short, but it is not deemed necessary.	
From 7 to 13,	19.16,	Across a narrow ridge, the cutting at the culminant point being 30 1-2 feet; for excavation,	15,230 25
13—18,	15.00,	For embankment, puddling and waste,	970 00
		The expense of the embankments here mentioned, which form the basins between the locks, is inconsiderable on account of their being made with the materials of the deep excavation.	
		3 locks of 8.50 feet lift,	23,332 50
18 — 1, (M. 60,)	208.03,	Ground occasionally a little stony: for excavation, embankment, chiefly near the abutment of the aqueduct at Lackey's falls, below *Rocky Point Mill;* 3 wastes, 4 bridges,	13,241 20
		One lock of 8.50 feet lift,	7,777 50
		Total amount,	$ 980,062 70

The expense of the eleventh Map is, consequently, 72,822 75 dollars,
And with the addition of 10 per cent. for contingencies, &c. - - 80,105 00 dollars.

mated expense of the canal on the south side of the river, makes an aggregate of $145,105, which would certainly be exceeded on the north side by a considerable amount, especially if this consideration be introduced, that the locks would have to be at a distance from each other; whereas on the south side, several of them may be placed under the same inspection and management.

Amount brought forward, . . . 980,062 70

8th Map.—*From* Rocky Point Mill *to the* North Branch.

Distance by the Canal 10.90 miles.
Lockage - 76.82 feet.

Stations.	*Distances in 4 pol. chs*	*Observations.*	
From *y* to *p*,	11.79,	Across the river which is 440 feet wide: for a stone aqueduct composed of 7 arches of 52 feet span, 16 feet rise, piers 8 feet thick. The water line 28.57 feet above the river. The river is shallow and foundations good.*	84,300 00
		This is at the head of Leckey's falls.	
		For embankment and puddling next to the north abutment,	1,752 80
p—121, (M. 30,)	256.70,	Ground generally good. Some excavation 9 1-2 feet deep for a few chains occurs in this distance: for excavation, some embankment and puddling, 3 bridges and one waste,	11,842 30
		2 small culverts,	1,530 00
		4 locks of 7.70 feet lift each,	29,106 00
121—116, (M. 30—34,)	21.67,	Along a steep rocky hill side, composed of lime stone and slate close to the margin of the river 17 feet above it. The water is 4 feet deep: for excavation of earth and rock, puddling, some paving, which is nearly 640 dollars per chain.	13,822 70
116—100, (M. 44,)	88.68,	Towards the beginning of this distance there is 15 feet depth of cutting. Harper's creek is next crossed by an embankment; after which there is again some deep cutting not exceeding 6 1-2 feet. Lastly, *Cedar Creek* is crossed: for excavation, embankment and puddling,	5,187 80
		For an aqueduct over Cedar creek,†	7,000 00

Amount carried forward, - - - - - $1,134,604 30

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* The river might be crossed as recommended by Moore and Briggs in the pond of a dam raised a short distance below. There is some drift wood accumulated at the place where the canal would have to be resumed, and also some gravel; but this inconvenience is not of an insuperable nature. An aqueduct, though more expensive here than a dam and the other works requisite at the entrance of the canal, is nevertheless much preferable; it might be so built as to answer likewise the purpose of a bridge, which would be very useful at this place, and afford, probably, considerable tolls.

If, however, rigid economy should be consulted, I would even prefer a wooden aqueduct to a dam; it would very likely not cost more than the dam and its appendages; and, though perhaps more perishable, it would more than compensate this defect by other advantages.

† *Cedar creek* is spanned by the Natural Bridge and turns Gilmore's mill; though it is large enough to feed a canal, except in great droughts, it is not noticed in Moore's report.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	1,134,604 30
		The aqueduct must necessarily be built below the mill; the creek might be made to supply the canal with some water; but, if there appeared to be a deficiency before reaching the next creek, it would be preferable to use Jennings' creek, where there would be no damages to assess; whereas here a feeder taken out of the creek would interfere with the mill. It is presumed, however, that neither of them will be wanted.	
Fr. 100, to 64, (M. 44,) (M. 58,)	175.06,	Ground variable, but mostly stony: some cutting 6 feet deep at the beginning, occasioned by the low level pursued, in order to keep below some ledges and cliffs: for excavation, some embankment and puddling, 3 wastes, 2 bridges,	9,254 50
		2 locks of 7.70 feet lift,	14,553 00
64 — 61, (M. 58,) (M. 64,)	43.77,	Along lime stone cliffs, and passing below *Irvine's Creek*, which forms a cascade, close to the margin of the river, and must necessarily be received into the canal. The level is 18 feet above the river, which is shallow: for embankment, puddling, paving and waste,	19,474 80
		Which is about 445 dollars per chain.	
61—38, (M. 64,)	106.89,	Ground generally good: in this distance *R. Irvine's branch* and *Crawford's creek** are crossed: the cutting is 7 feet deep at one place, and the ravines of the two creeks require considerable embankment: for excavation, embankment, puddling,	7,056 20
		2 culverts and expense for bringing Crawford's creek into the canal as a feeder,	3,270 00
		for 2 locks of 7.70 feet lift,	14,553 00
38 — 35, (M. 82,)	16.03,	Along a very rocky hill side composed of lime stone, close to the river, which is 10 feet deep for several chains, and above which the level is 13.93 feet. Building in deep water may be avoided by excavation out of the hill: for excavation, puddling, paving,	7,291 00
		Which is about 455 dollars a chain.	
Amount carried	forward,	- - - - -	$1,210056 80

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* In Moore's report, page 60, it is said *crossing Crawford's creek*; but there is no estimate added for it beyond 3 feet cutting at 12 1-2 cents: it is, however, a considerable stream. R. Irvine's branch is not noticed.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	1,210,056 80
From 35 to 4, (M. 82 — 98,)	159.49,	Passing *A. Paxton's;* ground generally good: for excavation, some embankment towards the end, 4 bridges and a waste,	9,102 90
		For two connected locks, by which the canal is dropped 15.22 feet into the North Branch of James River,	20,000 00
		Total amount of the second section,	$1,239159 70

And with the addition of 10 per cent. for contingencies, &c. $ 1,363,076 00
Which is about - - $ 25,247 per mile of the canal,
And - - 22,530 per mile of the river.
The expense of the 8th Map is $ 285,007.

The cost of the two last locks is stated higher than the usual standard, on account of the difficulty that will probably be experienced in their foundation. Owing to the height to which the river has been raised by the dam at the Witch falls, together with the natural depth of the North Branch there, it is probable that the foundations of these locks will have to be sunk much below the level of their floor, the ground being apparently all alluvial to very near the level of the bottom of the river. Some additional expense will also be necessary for the protection of the outlet of the canal into the North Branch, from which the locks should not be too far removed, in order that by a rush of the water out of the locks, this outlet may be cleared from the alluvions which would otherwise settle in it. All these circumstances are considered in the estimated cost of the locks. The outlet of the canal should incline at an angle of about 45° down the stream.

The North Branch must be crossed in the pond of the dam; a tow-bridge would be useful, but not indispensable for this purpose; the construction of its piers and abutments would present great difficulty in the depth of water of the pond, which was even considerable before the erection of the dam: no estimate for a bridge has, therefore, been included in the above statement; the crossing of the North Branch at that place will generally be very safe.

The width of this river is 221 feet.

THIRD AND FOURTH SECTIONS.

9th Map.—The third section begins at the North Branch, and extends along the northern margin of James River, through the gap of the Blue Ridge, down to near the head of the Cushaw Falls. There the river is crossed in a Natural Pond with the assistance of a towing-bridge.

The fourth section begins half a mile above the Cushaw Falls, and continues on the south side of James River to Judith's Creek, where it ends.

Seven miles of the canal from the North Branch to the lower end of Piney Island, (163d mile,) are in construction and will soon be completed. They comprise the whole of the 3d section and 2½ miles of the fourth. Being now under the direction of the James River Company, they do not belong to this report. This part of the canal has been the object of several reports, to which I beg to refer for further information. (V. Ninth and Tenth Annual Reports of the Board of Public Works.)

The fall overcome by the canal through the Blue Ridge is 96 feet; but when the canal is extended downwards, the two last locks will become useless, and consequently the last 18 feet of lockage, which are the lift of these two connected locks will also be comprised in the continuation of the canal. So that, as regards the object of this report, it must be considered that only 78 feet are overcome by the work now in progress through the Blue Ridge.

CONTINUATION

OF THE

FOURTH SECTION.

From the lower end of PINEY ISLAND *down to* JUDITH'S CREEK.

Distance by the Canal 16.45 miles.
Do. by the River 16.00 miles.

9th Map.—The distance between the Blue Ridge and Lynchburg is the most difficult part of the river to improve by an independent canal; it is a succession of steep hills, high and much broken banks and tremendous cliffs, interrupted only by deep ditches or natural canals, which must necessarily be used, as the hill sides along them are generally impracticable. These canals at first sight may appear calculated to diminish the expense, but it is quite otherwise. They commonly require considerable embankments to close their several outlets, and expensive dams and wastes to get rid of the water brought down by the numerous creeks which flow into them: this, together with the clearing of timber out of them, the shaping or raising of their banks for tow-paths, makes them rather an obstruction than an advantage.

Beginning at the lower end of *Piney Island*, just below the 163d mile tree, 36 chains of good ground are passed over, and a considerable run crossed, next to which the first Natural Canal is found and pursued for 60 chains: it ends opposite the head of Clay's Island, at the mouth of *Rocky-run*, which must vent itself over the dam by which the lower outlet of the Natural Canal is to be closed.

There a rocky hill side begins, which lasts 40 chains and compels to build in the river: after a short interval of 14 chains, another bluff 8 chains in length, throws the canal again in the river. Thence excavation is practicable, but very expensive, being among ledges and large masses of rocks for 25 chains, in which distance a considerable stream, *Strong Creek*, is crossed; beyond it, the level is lowered into a second Natural Canal, which continues for 78 chains; it ends at *Red Creek*, and must be closed at both extremities by dams, the lower one being so made as to answer for a waste-weir for the water of Red Creek, which is a copious stream. From this point 36 chains more place the canal opposite to Waugh's Ferry, to which point it was proposed, in 1825, to extend the canal now in construction through the Blue Ridge: this is a little above the end of the 159th mile.

10th Map.—After an additional distance of half a mile of tolerably good ground, the line of the canal comes to a high bank which, by preserving a high level, may be trimmed down and the canal shaped out of it. This bank, after a short distance, becomes a steep regular slope extending down to the river, which is very deep: it will be best, therefore, to cut the canal out of the hill side with reduced dimensions. Near the end of the 158th mile, at the head of *Roach's Island*, the hill assumes the shape of a high vertical cliff, which leaves no other alternative than to build in the river, though deep at this place, the other side being equally rugged. Moore and Briggs, to avoid the difficulties in the way of the continuation of the canal here, recommended the use of the river with the assistance of a tow-path: their plan would probably be cheaper, but not so much so, as to induce a rejection of the independent canal, which is by no means impracticable there: if the river be used at any place, it is obvious that such boats as would navigate the canal could not at all times take the river with safety; the current in freshets, and frequently also, the wind would make their progress dangerous. The canal boats must, therefore, be adapted to the river navigation; in which case a lock and dam improvement would nearly answer as good a purpose. The place, besides, where the canal would have to be resumed in this case is particularly disadvantageous, as its entrance would often be stopped up by the drift wood left there by the river, and its approach rendered dangerous by the timber evidently wafted towards this point at high water.

At the end of Roach's Island, a little below the 157th mile tree, the third Natural Canal commences; it continues for upwards of ¾ of a mile, and reaches to near the end of the 156th mile. There the canal will again be along a steep hill side covered with large fragments of rocks for 47 chains, just below which the fourth Natural Canal begins; it must be entered under the protection of a considerable embankment; it terminates opposite the 155th mile tree. After this, the canal passes for 56 chs. along a rocky slope down to opposite *Pedlar Creek;* there the ground is good for a short distance to near the head of *Persimon Island*, where begins a steep rocky hill side: This becomes a considerable bluff a little below Persimon Island and the 153d mile, and induced Moore and Briggs to use the river a second time for 61 chains. The ground continues bad to the 152d mile tree above Bald Eagle Island, where a fifth Natural Canal is taken as far as the island. There a new cliff 25 chains in length must be passed by embankment, after which a sixth Natural Canal 37 chains long begins; it continues to opposite Bethel about the end of the 151st mile. From this point the canal keeps, with only short intervals, along rocky and steep hill sides, close to the river and frequently in its bed, to *Judith's Creek* near the 147th mile tree, where the survey stopped in 1824, and the 4th section terminates.

The 11*th Map*, contains only the length of 2½ miles, above Judith's Creek, where the section terminates. About 1¾ miles above it, Moore and Briggs recommended to take the river and continue in it as far as Judith's Creek. This plan is less objectionable here than above, and would save a considerable expense if a feeder was taken out of the river at this place: but if on the contrary it was, upon minute examination, deemed unnecessary, the expense of resuming the canal, naturally connected with their plan, would greatly diminish the balance in favor of using the river: and a continuous canal would obtain a decided preference.

Between Piney Island and Judith's Creek, from marks that were made, it appears that freshets rise sometimes as high as 22 feet.

ESTIMATE

OF THE

CONTINUATION OF THE

FOURTH SECTION.

9th Map.—From PINEY ISLAND *to opposite* WAUGH'S FERRY.

Distance by the Canal - 3.70 miles.
Lockage - - - - 12.40 feet.

Stations.	*Distances in 4 pol chs*	*Observations.*	*Expense.*
From 59 to 7,	35.52,	Beginning at the end of the canal thro' the Blue Ridge, in continuation of the level which is 18 feet above the river; ground good for excavation:	
		For excavation and embankment, with puddling,	2,713 40
		One culvert,	3,000 00
		One lock of 5 feet lift,*	5,850 00
7—17, (M. 41,)	59.58,	In a natural canal which ends at *Rocky Run*, below which a waste is made across the outlet of the Natural Canal, another embankment is also necessary at its upper end: for clearing the Natural Canal, making tow-path, high embankment at the upper, and dam at the lower end; also, a bridge,	2,758 50
17—32,	39.68,	Along a rocky hill side and 18.40 feet above the river; water shallow: for embankment, puddling, paving, some excavation and waste,	18,936 20
		Which is about 480 dollars a chain.	
32—37,	13.74,	Short interval of good ground; for excavation and a little embankment,	671 10
Amount carried	forward,	- - - - -	$ 33,929 20

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* A lock of 4 feet lift would actually be sufficient to lower the canal to the new level, but by raising the walls and gates of this lock so as to give it a lift of 5 feet, the height of the lock above will be lessened, and both will be brought nearer to an equality. There being in fact only 4 feet additional overcome, is the reason why the lockage of the map is stated at 12.40 only.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - - - -	33,929 20
From 37 to 41,	7.66,	Along a short cliff: for embankment, puddling, paving,	3,280 80
		Which is about 430 per chain.	
41—52, (M. 59,)	35.35,	Stony and even rocky: for excavation, some embankment, puddling,	5,306 60
		A culvert of 12 feet span over *Strong Creek*,	2,100 00
		One lock of 8.40 feet lift,	7,686 00
52—72, (M. 73,*)	70.32,	In the bed of a Natural Canal, which ends at *Red Creek:* for tow-paths, several embankments and one bridge,	3,909 60
		For a dam across the bed of the canal below the mouth of Red creek, and some embankment,	1,230 00
		Red creek is a copious stream; it must necessarily be received into the canal, and will furnish some water-power to dispose of.	
72—79,†	36.22,	Good excavation, some embankment and puddling across the bed of a creek,	1,915 80
		For a culvert,	780 00
		Total expense of this part of the 9th map,	$ 60,138 00

And with an addition of 10 per cent. for contingencies, &c. $ 66,152

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* It is about this place that Moore and Briggs recommended taking the river in order to avoid great difficulties in the way of the canal just below. This plan, though perhaps cheaper, does not appear preferable to the continuation of the canal. If the river be used here, the idea of a perfect navigation must be abandoned; for it is evident, that the same boats which might navigate the canal, could not proceed with safety and certainty in the river; the water is too deep for poling, rowing would often be impracticable, and towing very frequently dangerous and even impossible along cliffs, against which, it is said, and appearances indicate, that the river impinges with great violence when high: this circumstance, together with the floating timber, which evidently comes in great quantity in this direction, and occasionally strong winds, would often stop the progress of heavy loaded boats; so that this navigation would be little better than if the bed of the river was altogether used. The making of a good tow-path along these rugged cliffs, is besides a work of some difficulty, which, together with the expense of a dam below, and all the appendages of the beginning of a new section of canal, especially at a place where drift-wood is accumulated, would leave so small a balance in favor of using the river, that to interrupt the line of canal would be inexpedient. Nothing could be gained by crossing the river, the other side being even worse than this.

† 79 is opposite Waugh's Ferry, and below Jack's Falls.

Amount brought forward, ... 60,138 00

10TH MAP.

Distance by the Canal 10.16 miles.
Lockage - 56 feet.

Stations.	*Distances in 4 pol. chs*	*Observations.*	
From 79 to 89,	46.81,	Ground good at the beginning, stony at the end of this distance: for excavation and a waste,	3,353 20
89—97,	22.82,	Along a high bank, which, on the high level which has been preserved, may be trimmed down to the level of the canal. A lower line would compel to build in the river, which is more than 15 feet deep in places. The elevation of the level above the river is 26.25 feet: the dimensions of the canal are calculated to be reduced to a width of 22 feet, lined with puddle, upheld by small inside walls, wherever necessary. Most of the cutting will be through rock: for excavation, puddling, walling,	9,201 20
		Which is at the rate of 403 dollars per chain.	
97—124,	66.18,	Along a hill side. on which the clay evidently rests on a bed of solid rock, the slope of which averages 30 degrees The depth of water at its base requires that the canal, with dimensions reduced as above should be shaped out of it: wherever the rock shows fissures, the canal should be lined with a small wall of brick laid in hydraulick lime. The bank is held up outside by a dry wall whose height varies according to the slope. The level continues to be 26.25 feet above the river, which averages 15 feet in depth and has no fall. There being at the end a distance of 13 chains of good ground, advantage is taken of it to lock down: for excavation mostly of rock, much walling both inside and outside, puddling, embankment and waste,	23,819 60
		Being at the rate of 360 dollars per chain, which is cheaper than building in the river even in common cases.	
		Two small culverts,	1,710 00
		One lock of 8 feet lift just at the end,	7,440 00
124—145,	68.43,	At 124 the water is yet still and 8 feet deep; it becomes shallow only after 16 chains near the head of Roach's island,	
Amount carried	forward,	- - - -	$ 105,662 00

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	105,662 00
		where it begins to flow with great rapidity. The cliffs being too steep and bad to allow of making the canal as mentioned just above, it has therefore been lowered to 18.30 feet above the river; it must be built upon a foundation of large rocks which will be easily detached from the hill. At the end of this distance the line is 23.46 above the river; it ends at *Indian-run*, just at the lower extremity of *Roach's Island:* for embankment, puddling, walling, paving, waste,	57,192 60
		For a culvert of 12 feet span over Indian run,*	1,950 00
From 145 to 166, (M. 10,†)	72.44,	At the beginning of this distance the level is dropped 8 feet, and proceeds along a Natural Canal, which requires an embankment to be raised at the beginning: after having locked down once more the Natural Canal is still pursued until it confounds itself with the ravine of *Cove Creek*, across the mouth of which a dam must be built in order to close the Natural Canal and pass over to the side of the hill along which the canal is resumed by excavation. Almost immediately below, a culvert is thrown over *Tumbling run*, which mingles its waters with those of Cove Creek, just at their common outlet into James River:‡ for embankment, excavation, puddling, dam across Cove Creek, and bridge over the Natural Canal,	4,031 50
		Culvert of 12 feet span over Tumbling run,	2,100 00
		2 locks of 8 feet lift,	14,880 00
166—180, M. 10—18,)	47.32,	16.23 feet above the river, along a hill side which affords good earth, but where, besides occasional ledges to be cut through large masses of rocks, which have apparently tumbled down from the brow of the cliffs above, will	
Amount carried	forward,	- - - -	$ 185,816 10

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* *Indian run* is a beautiful limpid stream and is said to afford at all seasons a plentiful supply of water; it falls in cataracts from above the canal, and consequently may be brought into it from a distance of a few yards at an inconsiderable expense; if always as abundant as I saw it, the canal would proceed from it as full as at its beginning.

† This is the place where Moore and Briggs resumed the canal.

‡ These two runs are the last of this section from which an adequate accession of water may be obtained.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	. . . . .	185,816 10
		have to be removed: for excavation, puddling, some embankment and paving, and a waste,	12,149 30
From 180 to 190, (M. 18,)	33.00,	Along a Natural Canal, which will require an embankment to be raised nearly all the way; part of this will be furnished by some deep cutting at the beginning: for embankment, puddling, dam and waste, and also bridge across the lower end of the canal to transfer the tow-path to the other side of it,	4,231 80
190—206, (M. 36,)	56.08,	Along a rocky slope, but which contains much good earth: for excavation, some puddling,	6,040 70
206—216, (M. 36—46,)	45.94,	Along a narrow bottom; good ground: for excavation, a little puddling and a waste,	2,721 60
216—242, (M. 46,)	61.96,	Beginning about the head of *Persimon Island*, along a steep hill side, where the line is kept at an elevation of 29.50 feet above the river, the upper slopes being more gentle and easy than those nearer to the river, which is deep. The width of the canal is reduced to 22 feet, &c. &c. An outside wall will be necessary in places:* for excavation, much of it rock, puddling, walling, both inside and outside, and a waste,	29,593 40
		2 small culverts,	1,910 00
		Which is at the rate of about 510 dollars a chain.	
242—249,	24.23,	This distance begins at the lower end of Persimon Island: the ground is rocky and comparatively level; the line being along there some distance from the river, this place is selected to lock down 16 feet, by which the level is placed 17.16 feet above the river. The canal must be thus lowered on account of the steepness and height of some bluffs just below, which will compel to raise the canal in the bed of the river: for excavation, puddling, walling,	6,132 00
		2 locks of 8 feet lift each,	14,880 00
Amount carried	forward,	. . . . .	$ 263,474 90

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* A minute estimate was also made of the expense of passing along the base of this hill on a low level, and consequently building in the river; the result was fifty thousand one hundred and twenty-eight dollars, or about 840 dollars a chain.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	. . . . .	203,474 90
From *249 to 257,	30.43,	Along a high cliff, at the base of which the water, for part of the distance averages 8 feet deep. The level is 17.16 feet above the river: for embankment in the river, puddling, inside walling, paving, -	22,341 80
		Which is at the rate of about 730 dollars a chain.	
257—269,	28.10,	For 6 chains some good ground; then a cliffy declivity opposite the *Horse Fording Island:* for excavation, embankment, puddling, inside walls, paving,	13,215 90
269—282, (M. 7,)	50.24,	Chiefly along a Natural Canal, the bank of which is very irregular and broken: for considerable embankment, puddling, some excavation,	4,141 00
282—288, (M. 7—16,)	25.11,	At the base of a rocky steep hill side, along *Bald Eagle Island:* for excavation principally of rock, embankment, puddling, walling, paving, and a waste,	16,977 90
		Which is at the rate of 676 dollars a chain.	
		One lock at the lower end, of 8 feet lift,	7,440 00
288—300, (M. 16,)	37.32,	Along a very imperfect Natural Canal, opposite *Bethel.* The side of the hill is an almost perpendicular cliff: for considerable embankment at both ends, puddling, road-bridge,	4,920 20
300—318,	69.52,	Good ground for a quarter of a mile; then along a rocky hill side, but out of the river. From the appearance of the timber there must be much good earth under the rocks: for excavation, some embankment, puddling, a waste,	7,211 40
		One lock of 8 feet lift.	7,440 00
318—330, (M. 45,)	30.23,	The rocky hill side approaches closer to the river; the base of the bank will be in the water: for excavation, some embankment, puddling, paving, one waste, inside walling,	9,379 20
330—333, (M. 45,)	10.59,	Short interval of good ground: for excavation,	616 70
		This is opposite the head of *Chesnut Island.*	
		Total amount,	$ 357,159 00

Which makes the cost of the 10th Map, - $ 297,021 00
And with the addition of 10 per cent. for contingencies, &c. 326,723 00

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* About this place Moore and Briggs recommended again to use the river for 61 chains, to avoid the obstacles just below; the same reasons as above, exist here against this plan: it is even doubtful whether, in so short a distance, there would be any economy in it; for, the expense resulting from this estimate between stations 249 and 269, is only $ 35,557 70, which a dam, guard-lock, &c. and tow-path along these cliffs some of which are almost vertical, might cost.

Amount brought forward, - - - 357,159 00

11*th Map.—Which ends at* Judith's Creek, *where the survey stopped in* 1824.

Distance by the canal - 2.59 miles.
Lockage - 8 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 333 to 344,	39.54,	This distance begins at the head of *Chesnut Island*, along a rocky hill side 20.23 feet above the river, but not in its bed; the ground becomes gradually better and is quite good at the end: for excavation, puddling and paving,	7,756 90
344—352, (M. 61,)	30.56	Pretty good ground; through which, after locking down, there will be some deep cutting, which is calculated to be used in the embankment just below: for excavation, some embankment and puddling,	2,051 60
		A culvert of 6 feet span,	950 00
		A lock of 8 feet lift,	7,440 00
352—374, (M.61,*)	113.94,	Along a rocky and steep hill side 18.32 feet above the river, which has no fall and is deep for a considerable distance. The base of the bank will be in the water, and the canal, as in other bad places, reduced to 22 feet width. It is probable, that although covered with rocks, good clay will also be found in this hill side; the growth of timber gives this indication: for embankment, puddling, walling, paving, and one road-bridge,	54,730 30
		Which is at the rate of about 490 dollars per chain.	
374—378,	24.40,	At the commencement of this distance the river begins to fall. The ground is pretty good. 378 is on the bank of *Judith's Creek*: for excavation, and bridge,	604 00
		Total expense of the continuation of the 4th section,	$ 430,691 80

And with an addition of 10 per cent. for contingencies, &c. $ 473,761
Which is at the rate of 28,800 dollars per mile of the canal.
The distance by the river is too nearly the same to make any material difference.

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* Here Moore and Briggs recommended to use the river down to Judith's Creek, and to resume the canal just at the mouth of the creek: This plan would save much expense if, as is presumed, a new feeder should be thought necessary here. Otherwise it would be proper to set against the above stated expense of making the canal along the steep hill side, the cost of a dam, guard-lock, tow-path above the dam, and deep cutting and walling or paving below, and undoubtedly the difference would then appear too inconsiderable to compensate for the disadvantage of interrupting the continuity of the canal.

At this point the survey was stopped in 1824; it was selected on account of its being the beginning of another section, it appearing possible that a new feeder may be deemed expedient at this place. Two bench marks were made on the banks of the creek; their levels are recorded in the 4th field-book.

Although the ground from Piney Island to Judith's Creek is certainly the worst section of the whole river, still the estimated expense per mile, is less than the cost of the canal through the Blue Ridge: for this, there are several reasons; the two beginnings of the sections at the Blue Ridge, have required very expensive works; the canal there has a much greater lockage per mile, and also its construction might have been cheaper. It is by a careful calculation and combination of all the elements furnished by the survey, at each successive step, that the estimate of the continuation of the canal below Piney Island, has been reduced to the above stated sum; but a trial and comparison of several plans, has convinced me, that without the most strict and critical attention to every local circumstance, the cost might be very considerably increased.

FIFTH SECTION.

From JUDITH'S CREEK *to* JOSHUA'S FALLS.

Distance as the river runs, 17 miles.

In this section the canal will probably he shorter than the river.

This and the following section have not been surveyed, but merely examined. From Judith's Creek to Lynchburg the distance is about 4½ miles; the ground is very bad in places, but there are also stretches of good ground. The importance of the town of Lynchburg would require a large basin to be made there; for which there is a most excellent site just below the bridge. From Lynchburg down as far as the 130th mile tree, there is not much difference between the two sides of the river, though the south side appears rather the best; but below this point the north side is infinitely better. The river must accordingly be crossed at some point between the end of the 130th mile and Lynchburg. The place of crossing, not being indicated by the nature of the ground, must be selected with a view to the most suitable division of distance for feeding the canal.

Moore and Briggs proposed to cross James river about the middle of Winston's Island, nearly opposite the 141st mile tree. This point is only 6 miles from Judith's Creek, where they had taken a new supply of water, and would be too far from Tye river, to continue the canal for the whole distance, which is 37½ miles, without taking in another feeder. It appears therefore inexpedient to cross the river at Winston's Island, where, besides, there exist several other objections to the plan, namely: the fall per mile is not great, and the canal would not rise fast enough above the river; so that the bank on the left shore being high, much deep cutting would be the consequence; and again, two dams and four abutments would be requisite, for which the island itself would be an unsafe support.

The end of the 130th mile, on the contrary, is as favorable a place as could be desired to cross the river and take in a fresh supply of water. It is only 26½ miles above Tye river, and affords an excellent site for a dam at *Joshua's Falls*. These include nearly the whole fall of the 131st mile, which is 7.15 feet; hence, by raising the water 8 feet by a dam at Joshua's Falls, the canal, in about 500 yards, would attain an elevation of 15 feet above the river, which would be sufficient to pass over the creek at *Galt's Mill*, about a mile below; and would place the line high enough not to require any expensive cutting, the bank being rather low on the north side.

From Judith's Creek to Joshua's Falls it is 17 miles, which is a very eligible distance for the length of a feeder. It is, however, possible that, upon more critical examination, the tributary streams crossed in this section may be found adequate to keep up the supply as far as Joshua's Falls, without resorting to the river at Judith's Creek. From *Tumbling run*, at the end of the 156th mile, and 9 miles above Judith's Creek, it is 20 miles to *Beaver Creek*, and *Lewis's Mill Creek* below Lynchburg: and if these two last streams should be found, by gauging, to afford a copious body of water, the supply obtained at Indian and Tumbling runs, might be regenerated by them, so as to be with great ease extended to Joshua's Falls, which are only 6 miles farther. And, indeed, if there was not so great an economy in crossing James river in its own bed, instead of an aqueduct, the accession of *Stoval's Creek*, which turns Galt's Mill, would perhaps be sufficient to carry on the canal as far as Tye river.

SIXTH SECTION.

From JOSHUA'S FALLS *down to* TYE RIVER.

Distance by the river 26½ miles.

Whether a new feeder be taken in at Judith's Creek or the canal be supplied by lateral streams, the river must be crossed in the pond of a dam raised on a favorable ledge at Joshua's Falls: an aqueduct would be rather too expensive. The great fall of the river, with the assistance of the dam, will procure a sufficient elevation to pass over Stoval's Creek, an advantage seldom obtained so near the beginning of a canal. The bank on the north side being low, the depth of cutting will probably not exceed what is necessary to raise the bank of the canal above ordinary freshets. From Stoval's Creek down to Tye river, there is no considerable difficulty in the way of the canal.

The distance from Joshua's Falls to Tye river, is not too great to depend upon the feeder taken from James river at the beginning, and it may very likely be helped by several intervening tributaries.

From a comparison with other sections that have been carefully estimated, I think it probable that the 43½ miles between Judith's Creek and Tye river, which have not yet been surveyed, and include the two last sections,

Will cost about - - $890,000

SEVENTH SECTION.

From Tye River *to the* Seven Island Falls.

Distance by the Canal 37.71 miles.
Do. by the River 38.34 miles.

This section may either be fed from James river by raising a dam across it below the mouth of Tye river; or, it may obtain its supply from Tye river itself: this last plan would be both safer and less expensive.

The mouth of Tye river is about half a mile above the 103d mile tree, at a small place called *New Market*. This river should be passed by an aqueduct, and the feeder brought from some distance above by a race. From this point the canal must proceed along the base of the hills, where nothing remarkable occurs until the 97th mile, at the Swift Island Falls; there a cliff 38 chains long compels to build the bank of the canal in the river. Thence the canal continues through favorable ground, and passes round Warminster, below which, at the end of the 91st mile, a little below the marble quarry, a steep rocky hill side 20 chains in length interferes with the canal. From this to *Rockfish river*, the most remarkable circumstance is Doctor Patterson's pond, which will produce either much expense for embankment along it, or some deep cutting below, the ground near it being very low. Rockfish river must be crossed by an aqueduct and some water taken out of it; its mouth is about the middle of the 86th mile. Below Rockfish river, the ground is much broken, stony and intersected by numerous gulleys and runs, the most considerable of which is *Ballinger's Creek*, at Warren, near the middle of the 80th mile. Below this, and after having crossed *Totier and Rock Creeks*, the canal reaches the small town of *Scottsville*, a little above the end of the 73d mile. The ground through the town is favorable to the construction of a canal, nd of a suitable basin. But the turnpike now making from

Staunton to this town, will probably cause the erection of many houses which would hereafter interfere with the most advantageous location of the canal; it might therefore be expedient now to mark out and reserve through the town a sufficient space for the canal and a basin.

Below Scottsville the ground is rocky, and a cliff 52 chains in length soon occurs, which compels to build in the river: it ends near the 72d mile tree. A little above the end of the 69th mile, bluffs begin which interfere with the excavation. They continue, with a few short interruptions, for 73 chains. *Hardware river* is next crossed, near the extremity of the 67th mile; it does not appear advisable to get any water from it. At the end of the 66th mile, the cliffs above Scott's Mill begin and continue for several miles. The section ends near the 65th mile tree, which is about at the head of the principal falls at the Seven Islands: there the canal descends by locks into the race of Scott's Mill, which is proposed to be extended upwards to this point; and is the commencement of the next section.

ESTIMATE

OF THE

SEVENTH SECTION.

16*th Map*.*—*From* Tye River *to* Warminster.

Distance by the Canal - 9.31 miles.
Lockage - - - - 24 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
		Tye river is a fine stream 192 feet wide; it will supply the canal abundantly: probable expense of bringing a feeder from a favorable point half a mile above,	3,500 00
From 537 to 468, (M. 370 — 409,)	449.43,	This distance begins on the eastern bank of Tye river, 15.79 feet above it. The river should be crossed by an aqueduct, at an elevation of about 30 feet, and then lowered by two locks to the above level, in order that the feeder taken from this river may be as short as possible.† From Tye river the line is carried along the base of the hills at the edge of the low grounds: ground stony: for excavation, 2 wastes, 6 farm-bridges,	31,776 90
		Two culverts,	1,650 00
		Two locks of 8 feet lift,	14,880.00
468—456, (M. 409—418,)	38.37,	Along cliffs at the Swift Island Falls, 19 feet above the river: for embankment, some excavation, puddling, walling paving, one waste,	22,132 50
		Which is at the rate of about 550 dollars a chain.	
456—410 (M. 418,)	258.33,	This distance ends near the small town of *Warminster*. The ground is prin-	
Amount carried	forward,	- - - - -	$ 73,939 40

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* Numbers 12, 13, 14, 15, have been reserved for the maps of the yet unsurveyed part of the line between Lynchburg and Tye river.

† The aqueduct and locks being above the new feeder, do not belong to this section.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - - -	73,939 40
		cipally stony, though occasionally good: for excavation, some embankment and puddling, 3 bridges, 2 wastes,	22,923 80
		Two small culverts,	2,230 00
		One lock of 8 feet lift,	7,440 00
		Total expense of this map,	$ 106,533 20

And with the addition of 10 per cent. for contingencies, &c. $117,187

17*th Map—From* WARMINSTER *to* ROCK-FISH RIVER.

Distance by the Canal · 8.25 miles.
Lockage - 24 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 410 to 399, (M. 448,)	80.09,	Passing round the promontory on which the town of Warminster is situate; much variety of ground: for excavation, much embankment across hollows, a waste, a farm and a road bridge,	6,682 50
		2 culverts, one of them over Mayo's Creek at Warminster,	2,570 00
399—379, (M. 448—461,)	123.60,	Ground mostly stony, some deep cutting: for excavation, embankment, puddling,	14,057 60
		2 culverts,	2,380 00
379—372, (M. 461,)	47.22,	Along a very stony hill side: for excavation, some embankment and puddling,	4,537 30
		One lock of 8 feet lift,	7,440
372—359,	40.85,	For the first 20 chains of this distance the line is along cliffs 18 1-2 feet above the river, in which the canal is made by embankment. The remainder of	
Amount carried	forward,	- - -	14,2

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,		144,200 60
		- - - - the distance may be made by excavation, though the base of the bank will be in the river: for embankment, excavation, puddling, paving, walling,	17,963 90
From 359 to 330,	209.17,	Ground generally good for excavation: much embankment is necessary in this distance, especially along Dr. Patterson's pond, which is too low to make part of the canal; a lower level might render a culvert over the outlet of the pond impracticable:* for excavation, embankment, puddling, 2 wastes, 2 bridges,	22,816 30
		2 small culverts, one of them over the Pond-branch,	1,740 00
		One lock of 8 feet lift,	7,440 00
330—324,	33.23,	The ground washy and intersected by ravines: for excavation, embankment, puddling, one waste,	5,240 50
		A small culvert,	750 00
324—311,	68.15,	Stony: for excavation, puddling, one bridge,	6,536 60
311—299, (M. 507,)	58.76,	Good ground: for excavation,	1,671 60
		One lock of 8 feet lift,	7,440 00
299—297, (M. 507,)	18.26,	Across the ravine of *Rock-fish river*. The stream itself is 110 feet wide; it is crossed on a level 23 feet above it by an aqueduct. A supply may be brought from above by a race half a mile in length: the race should enter the canal below the lock which follows the aqueduct:† for considerable embankment and puddling,	3,362 00
		For an aqueduct consisting of 2 arches of 45 feet span each and 12 feet rise: the river is shallow and foundation rock,	25,300 00
		Total amount,	$ 244,461 50

The expense of the 17th Map is consequently	$ 137,928 30
And with the addition of 10 per cent. for contingencies,	151,721 00

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* It is proposed in Moore's report, page 73, to descend into this pond and to substitute it for a canal: the saving produced by this measure, would be more than counterbalanced by the following considerations: the canal would be so low as to be liable to be invaded by the river, unless a high guard bank was raised; our level touching the ground below, and the pond being 12 feet lower than it, there would be 15 1-2 feet depth of cutting for a considerable distance; and lastly, the level would be too low to cross Rock-fish river just below, by an aqueduct, which is the only advisable way to pass it.

† In Moore's report, p. 73, it is proposed to cross Rock-fish river by a dam 15 feet high; this plan, always objectionable, would be still more so in the present case: the dam would be necessarily too near the place of crossing not to make it often dangerous; its expense, as well as that of all the works incident to the crossing of so considerable a stream, compared to that of the aqueduct, would hardly leave any balance in favor of that plan. The dam would, besides, now interfere with the Mill lately constructed on this river by Mr. Chs. Scott.

Amount brought forward, - - - 244,461 50

18TH MAP.

Distance by the Canal 9.99 miles.
Lockage - - 32 feet.

Beginning at the eastern bank of ROCK-FISH *River*.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 297 to 289, (M. 517,)	50.56,	Probable expense of the feeder taken from Rock-fish river,	2,000 00
		For deep cutting in stony ground and some puddling,	6,836 80
		One culvert,	1,360 00
		One lock of 8 feet lift, below which the feeder should be received,	7,440 00
289—262, (M. 517—533,)	153.12,	Ground much broken and intersected by gulleys and runs; mostly stony; in places rocky and seldom good: for excavation, some of it deep, much embankment and puddling, two farm bridges, two wastes,	15,268 60
262—238, (M. 533,)	168.84,	A short cliff at the beginning; after which a considerable run is passed; then the ground is good to the end: for embankment and puddling, excavation, paving at the beginning, 2 wastes, 3 bridges,	13,327 80
		One culvert of 10 feet span,	1,750 00
238—230, (M. 563,)	75.96,	To *Ballinger's* creek at *Warren*; the ground stony: for excavation, 1 bridge,	5,552 50
		2 locks of 8 feet lift,	14,880 00
230—229, (M. 563,)	8.50,	Across Ballinger's Creek: for considerable embankment, puddling,	3,217 50
		An aqueduct of 30 feet span,	6,600 00
229—168,	356.20,	Passing at the beginning through the small town of *Warren*; ground more or less stony: for excavation, embankment, puddling, 1 road-bridge at Warren, 7 farm-bridges, 4 wastes,	22,201 50
		One small culvert,	580 00
		One lock of 8 feet lift,	7,440 00
		Total amount,	$ 352,916 20

The expense of the 18th Map is therefore, - $ 108,454 70
And with the addition of 10 per cent. for contingencies, &c. 119,300 00

Amount brought forward, - - - - -	352,916 20

19th *Map:—Last of the section.*

Distance by the canal		10.16 miles.
Lockage	- -	53.21 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 168 to 166, (M. 590,)	13.72,	To *Totier's Creek* ground a little stony: for excavation,	782 40
166—152, (M. 590—599,)	110.40,	This distance terminates at the small town of *Scottsville;* somewhat stony ground: for excavation, embankment, puddling, 2 bridges,	5,190 30
		Aqueduct of 21 feet span, and embankment across *Totier Creek,*	5,476 80
		Culvert and considerable embankment across *Rock Creek* at Scottsville,*	4,928 80
152—142, (M. 599—603,)	53.32,	Through the small town of *Scottsville;* a great part of this distance at the lower end is rocky; there is a good site for a basin at the beginning: for excavation, embankment, puddling, one bridge, and expense of turning the road,	3,835 20
		One culvert with waste,	3,000 00
		One lock of 8 feet lift,	7,440 00
142—124,	51.94,	Along a rocky hill side 18.89 feet above the river, in which the base of the bank will be: for excavation, embankment, puddling, paving,	22,553 60
		Which is about 434 dollars per chain.	
124—79 1-2,	235.05,	Ground stony: for excavation, some embankment and puddling, 4 bridges and 1 waste,	15,912 30
		One culvert,	1,600 00
		One lock of 8 feet lift,	7,440 00
79 1-2—70, (M. 639,)	45.24,	Along rocky hills and a cliff 2 chains in length at the beginning; the level is 19.59 feet above the river: excavation, embankment, puddling, paving, one waste,	5,387 10
		One culvert,	1,020 00
		One lock of 8 feet lift,	7,440 00
70 — 61, (M. 639—646,)	30.23,	Along a continued cliff, at the end of which the line is 17 1-2 feet above the river; the base of the bank will reach the water: for excavation, embankment, puddling, paving, one bridge,	10,958 30
Amount carried	forward,	- - - - -	$ 455,881 00

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* This creek is not noticed in Moore's report.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	455,881 00
From 61 to 47 1-2 (M. 646—654,)	86.78,	Down to *Hardware river;* the ground is various, some of it is very good, some very stony: for excavation, embankment and puddling, 2 bridges,	5,939 60
47 1-2—47, (M. 654,)	8.24,	Across the bed of Hardware river; the water-way of which is 85 feet wide: for embankment, and aqueduct consisting of two arches of 40 feet span and 14 feet rise,	19,837 80
47 — 22,	113.15,	Ground mostly stony, and in places rocky: for excavation, some embankment and puddling, 2 farm-bridges, 1 waste,	16,032 20
		One lock of 7.25 feet lift,	7,020 00
22 — 9,	42.31,	Along very stony ground: for excavation, embankment, puddling,	7,287 70
		Aqueduct of 24 feet span over *Rock-fish Creek,*	4,900 00
		Two culverts,	2,040 00
		One lock of 7.96 feet lift,	7,420 00
		2 locks of 7 feet lift each, by which the canal is lowered into the next feeder, which is the race of *Scott's Mill,* raised and extended upwards,	13,720 00
		Total amount of the 7th section,	$ 540,078 30

And with an addition of 10 per cent. for contingencies, &c. $ 594,086
Which is at the rate of 15,754 dollars per mile.
The expense of the 19th Map is - - 205,878

EIGHTH AND LAST SECTION.

FROM THE

HEAD OF SCOTT'S MILL RACE,

TO THE

CANAL AT MAIDEN'S ADVENTURE.

Distance by the Canal	-	44.41 miles.
" by the River,	-	44.00 "

Although, upon a cursory examination, this section might appear better than almost every other, it is nevertheless one of the most difficult to improve by an independent canal. The soil becomes more and more porous as we proceed downwards. The ground is much cut up by gulleys, ravines and creeks; and, while every circumstance tends to favor a deperdition of water, there is no section which affords less facilities to supply the canal with it. The tributaries are either small or sluggish, and all of them less constant than in the preceding sections: James river itself presents but imperfect sites for a feeder, from the Rivanna to *Rock-castle Falls;* and these are too near the end of the section to answer a very useful purpose. Every means and precaution will, therefore, have to be used to maintain the original supply; every lateral stream that does not dry up in the summer, must be put under contribution. The Rivanna river, Byrd and Pear creeks, are the principal streams which may be used to compensate the loss by evaporation and leakage, which object they may answer with proper management, especially if the new canal should not be extended lower down than the head of the pond formed by the dam at Maiden's Adventure.

20th Map.—The eighth section begins at about one third of a mile above the head of Scott's mill-race, near the 65th mile tree. The situation of the race being such that it must necessarily make part of the canal, it is proposed to extend it along the rocky bank of the river, up to the point here designated. By this means the race will include 3.29 feet more of the fall of the river, and consequently the level of the water in it will be raised by that much, which will more than indemnify the mill for the use of the race.

The plan of Moore and Briggs was *to raise the dam*, but the loose rocks thrown across the streams do not deserve this name, and consequently their plan would, in fact, require the erection of an entire dam, which appears quite an unnecessary expenditure. The river is here so wide and its fall so great, that it never rises high, and the canal would soon be out of its reach: and, as there is no deep cutting required at the beginning, but, on the contrary, the embankment of the canal must necessarily be in the stream, it is obvious that none of the reasons which usually advise the building of a dam, applies to this feeder. The extension of the bank of the race upwards, which is at all events indispensable, since the hills do not admit of cutting the canal out of them, will answer every purpose; so that the feeder taken from the river here, will not be attended with the ordinary addition of expense incident to the introduction of a new supply of water out of so large a stream; a low bank no higher than 12 feet above the river, is thought quite sufficient to protect the canal. The raising of the water in the race 3.29-100 feet will likewise have the effect of sufficiently widening it.

Keeping, then, along the base of the cliffs and in the race, the route of the canal should pass between the mill and the hill opposite to it; there much rock will have to be blasted away, the mill being rather too near the cliff to allow sufficient room for the canal, together with a convenient space before the mill.

The cliffs continue below the mill to about one-fourth of a mile above the 63d mile tree, thence to the end of the map the canal keeps along the base of the hills; much stony ground and rock occur in this distance; there are also several stretches of good ground. *Big Bremo* is crossed near the end of the 63d mile, and *Little Bremo* near the 62d. Some other creeks of less importance are also traversed: they are all too near the head of the feeder to be of any service as such. The canal at the 60th mile tree is opposite *New Canton.*

21*st Map.*—Thence to the Rivanna, the only thing worth noticing is the crossing of *Fork creek.* A little below the 51st mile tree the *Rivanna* is purposed to be crossed by a stone aqueduct 217 feet in length, which is the only practicable plan to pass this river, beyond which we come to the small town of *Columbia.* It being contemplated to improve the Rivanna, it is presumable that if the canal should be extended up to its mouth, the navigation of this river would be connected with the canal at Columbia by a level cut, made from some suitable point above. The accession of water thus obtained, would help in maintaining the supply in the canal, without adding to its expense: although it sometimes happens that the Rivanna is much depressed by long droughts, still as it is only 14 miles from Scott's mill, it will be more than sufficient to restore the water lost in that distance.

Just below *Columbia,* at the end of the 50th mile, the canal passes along a solid cliff 10 chains in length; thence it proceeds over much stony ground and next reaches *Byrd creek,* about the end of the 46th mile. This creek is crossed below the point where its two branches, *Big and Little Byrd* creeks, unite. Big Byrd creek turns a mill, and though it does not at all times afford a full compliment of water, it will undoubtedly be more than adequate to the purpose of restoring the small loss of water which will take place in the five miles between it and the Rivanna. So that it may be safely admitted, that the canal would proceed from the 46th mile tree with its full supply of water; and, if carefully made and puddled, it might be made to reach Maiden's Adventure without any further assistance. One mile below this, a rocky hill side sixty-six chains in length, throws the canal in the river; thence to the lower end of *Elk Island,* a little below the 44th mile tree, the ground is much broken ; then comes a bluff which places again the base of the canal in the river for 34 chains. The termination of this rough stretch is a little above the end of the 43d mile.

22*d Map.*—The route of the canal below Elk Island continues along the base of the hills, through uneven and generally bad ground, most of which is very porous, and some rocky. Near the end of the 39th mile it crosses *Pear creek,* from which it is probable that a sufficient accession of water might be obtained to compensate the loss of the last 7 miles. The line approaches to the margin of the river opposite *Bolling's Island;* some rocky hills are passed along, near *Mosby's* Island, about the end of the 36th mile tree, and in the vi- ty of the 34th mile tree the cliff at *Rock-castle* is passed.

Rock-castle falls afford a good site to take a feeder from James river; probably some difficulty of location and expense, as regards the completion of the canal, would have been avoided by building a dam here, instead of at Maiden's Adventure Falls; but now this site is rather too far from Scott's mill, and too near Maiden's Adventure. Should it appear, however, after a correct gauging of Pear creek, that it is insufficient to keep up the supply of water, it might possibly hereafter be found necessary to take a feeder at Rock-castle falls, if the canal was extended down to Maiden's Adventure: in this case it might be so located below the falls as to be easily connected with the dam, if it were afterwards deemed expedient to raise one at Rock-castle.

23d Map.—It is thought, however, that one-fourth of a mile above the end of the 30th mile and two miles above *Licking-hole creek*, it might be advantageous to take the river; which would render a feeder at Rock-castle entirely unnecessary. The objections against using the bed of a river in connexion with a line of canal, do not apply to this case in their full extent.

In the first place, the pond of the dam at Maiden's Adventure Falls begins about this point, and is consequently about 9 miles in length, and with the help of a tow-path along the shore, might be navigated with much greater safety than the upper sections of the river, as the current in it would not be so strong as above; and besides, such floods as would suspend its navigation would also interrupt that of the canal below, which would then be invaded in places and not permit such boats as must ultimately be used to pass under the bridges.

In the next place, the economy of the plan here suggested, would be its strongest recommendation: after having used the bed of a river, it generally happens that much expense is encountered for resuming the canal, for dam, guard-lock and other works: but, here these have already been built at Maiden's Adventure; and consequently the whole expense of cutting the canal for 9 miles. would be saved. This, owing to the badness of the ground, would be no less a sum than $184,000, as appears from the estimate below, and might even be as much as $26,000 more, if a feeder was found necessary to be taken at *Rock-castle*, which the continuation of the canal might require. It is probable that, at least for a long time, the inconvenience occasionally experienced in the bed of the river, would not be sufficient to justify so great an expenditure for the continuation of the canal over these nine miles, and if ever thought necessary, it would not be attended then with any additional difficulty or expense.

The canal, if continued below the 30th mile, would pass through good ground for excavation down to the end of the 26th mile; but, its expense would be swelled by the crossing of several ravines and streams, the most considerable of which is *Licking-hole creek.* At the 26th mile, a cliff 96 chains in length would have to be passed chiefly by embankment: thence to Maiden's Adventure, there would be but little good ground, and another cliffy hill 45 chains in length about the 23d mile would again place the base of the canal bank in the river. The new canal would lock into the present one a little above the end of the 21st mile, somewhat below the dam at Maiden's Adventure Falls.

ESTIMATE
OF THE
EIGHTH SECTION.

20th Map.—Beginning half a mile above SCOTT'S MILL *race.*

Distance by the Canal 11.21 miles.
Lockage - 24 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
From 11 to 569, (M. 677,)	27.53,	Extension of the bank of the race of *Scott's Mill* upwards, by which a height of 3.29 feet of water will be thrown over the surface of the present race, which will thereby be made sufficiently wide: for embankment, some paving, arch and gates,	7,506 00
569—549, (M. 677,)	46.00,	For raising, trimming, and paving the bank of Scott's Mill race,	7,340 00
549—546, (M. 685,)	4.81,	Passing before the mill, where some blasting will be required: for excavation, embankment, puddling, turning the road, one bridge,	1,928 50
		One culvert,	1,440 00
546—514, (M. 685—702,)	70.04,	Along a rugged hill side and cliff 12 ft. above the river at first, and about 22 feet at the end: for embankment, some excavation, puddling, paving,	31,959 40
		Which is at the rate of about 456 dollars per chain.	
514—506, (M. 702,*)	73.84,	This distance extends to the eastern bank of Little Bremo. The ground	
Amount carried	forward,	- - - - - -	$ 50,173 90

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* At this point in Moore's report, a long stretch 977.72 chains long begins, which is lumped at 12 1-2 cents per cubic yard, and the excavation 8 1-2 cubic yards per running yard, corresponding to a uniform depth of cutting of 3 feet. A low level that would cut altogether through the low grounds, could not even be excavated all the way for the average price of 12 1-2 cents, and there would be so much alternative of deep cutting and embankments, that the quantity of 8 1-2 cubic yards per running yard would be greatly exceeded. In addition to which, the canal would become the receptacle of all the wash from the hills; and the farms would be cut up by it. In the same stretch it is mentioned, that *Big Bremo*, *Little Bremo*, and other creeks are crossed, but no additional estimate is made on this account, over and above the bare excavation of three feet depth, at 12 1-2 cents per cubic yard.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	50,173 90
		is mostly good, except at the lower end: for excavation, 2 farm-bridges,	3,514 20
		Embankment and aqueduct of 30 feet span, 22 3-4 feet high, over *Big Bremo*,	6,226 30
		Embankment and culvert of 10 feet span over *Little Bremo*; 16 2-3 feet above its surface,	2,352 50
From 506 to 474,	194.48,	From Little Bremo to the *New-Canton* road, some ground good, some stony, and even rocky: for excavation, embankment, puddling, 1 waste, 2 farm-bridges, 1 road-bridge,	17,921 70
		2 small culverts,	1,530 00
		One lock of 8 feet lift,	7,440 00
474—429,	325.22,	Ground mostly good, though occasionally stony: for excavation, embankment, puddling, 1 waste, 5 farm-bridges,	24,132 40
		1 aqueduct of 24 feet span,	5,280 00
		2 locks of 8 feet lift,	14,880 00
429—413,	150.18,	Ground mostly stony: for excavation, embankment, some puddling, 1 waste, 3 farm-bridges,	13,710 70
		One culvert,	1,900 00
		Total expense of the 20th Map,	$ 148,361 70

And with the addition of 10 per cent. for contingencies, &c. $ 163,198

Amount brought forward, - - - 148,361 70

21st *Map.—Extending down to the lower end of* ELK ISLAND.

Distance by the canal 11.30 miles.
Lockage - 16 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 413 to 382, (M. 778,)	226.63,	Down to the right bank of the *Rivanna;* ground generally stony; it would be better on a lower level, but the line must be kept high for the aqueduct over the Rivanna: for excavation, embankment, puddling, two bridges, one waste,	17,587 00
		Aqueduct of 24 feet span, 12 feet rise, over *Fork Creek,*	5,400 00
382—380½, (M. 778,)	21.18,	Across the basin of the *Rivanna:* for considerable embankment and puddling on both sides, a road bridge,	5,213 80
		For an aqueduct 217 feet in length, consisting of 4 arches of 48 feet span and 16 feet rise each. The surface of the canal being 31.71 feet above the river. The water is not deep, and there is a good foundation for piers and abutments,	54,250 00
		Some water may be obtained from the Rivanna; but, as the feeder would benefit the navigation of this river, it may be considered as part of its contemplated improvement, and consequently the expense of it does not properly make part of that of the James river canal.	
380 1-2—*i*,	43.38,	Along the lower side of the town of *Columbia;* ground either stony or rocky: for excavation, embankment, puddling, one road bridge,	4,817 80
		For a culvert,	1,440 00
		One lock of 8 feet lift,	7,440 00
i—377, (M. 784,)	7.60,	Across a ledge of rock 24 1-4 feet above James river: for embankment, puddling, paving,	1,819 00
		Nothing is carried here for blasting, because the stone will find place in the works of art in this quarter.	
377—345 1-2, (M. 784—804,)	314.40,	This distance extends down to *Byrd creek;* much good ground, with occasional stony places: for excavation, embankment, puddling, seven bridges, 2 wastes,	20,340 40
		Two small culverts,	1,830 00

Amount carried forward, - - - - - $ 268,499 70

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	268,499 70
From 345½ to 342,	18.60,	Across the valley of *Byrd creek*: for embankment, puddling and an aqueduct of 36 feet span,	13,322 30
		Probable expense of a feeder taken from the creek,	2,000 00
342—335 1-2, (M. 816,)	80.13,	Ground a little stony: for excavation, some embankment and puddling, one bridge,	6,634 30
		One culvert,	900 00
		One lock of 8 feet lift,	7,440 00
335 1-2—320 1-2, (M. 816,)	66.39,	Along cliffs at an average height of 19½ feet above the river: for embankment, some excavation, puddling, paving, walling, one waste,	21,937 60
		For a small culvert,	900 00
320 1-2—307, (M. 839,)	102.37,	Ground generally good; for excavation, embankment, puddling, 2 bridges,	7,628 10
		4 culverts,	4,300 00
307—*b*, (M. 839,)	44.30,	Along broken and rocky ground; a bluff near the end 8 1-2 chains in length is passed 21.51 feet above the river: for excavation, much embankment and puddling, paving,	14,767 30
		One culvert,	1,080 00
		Total amount,	$ 349,409 30

The expense of the 21st Map is consequently, - $ 201,047 60
And with the addition of 10 per cent. for contingencies, &c. 221.152 00

Amount brought forward, - - -	349,409 30

22d Map.—Beginning at the lower end of Elk Island.

Distance by the Canal 11.30 miles.
Lockage - - 28.10 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From *b* to 272,	192.39,	Passing opposite to *Cartersville;* ground stony at the beginning, good at the end: for excavation, embankment, puddling, 4 farm bridges, 1 bridge on the Cartersville road,	12,281 60
		Two culverts,	1,770 00
		Two locks of together 14.10 feet lift,	13,818 00
272—246,	146.70,	Crossing in this distance *Pear creek,* near the head of *Bolling's Island;* the ground is generally stony, and even rocky near the beginning. Several ravines are crossed: for excavation, embankment, puddling, 2 farm bridges, one waste,	24,641 00
		A small culvert,	900 00
		One aqueduct over *Pear creek** 18 feet above its surface,	4,500 00
		Probable expense for bringing a supply of water out of this creek into the canal,	1,500 00
		Though this creek is perhaps not copious in summer, still it will probably be sufficient to maintain the body of water in the canal.	
246—216, (M. 891,)	205.78,	Part of this distance is along *Bolling's Island;* much variety of ground, from good to rocky. Many considerable ravines are crossed: for excavation, embankment, puddling, 3 farm bridges, 2 wastes,	21,545 30
		3 culverts,	4,650 00
216—201 1-2, (M. 891—904,)	109.16,	Down to *Rock-castle,* passing *Mosby's* Island; much stony ground: excavation, embankment, puddling; 1 bridge,	16,224 80
		One culvert,	1,250 00
201 1-2—198, (M. 904,)	9.80,	Passing along the cliff at *Rock-castle* 29 feet above the river:† for embankment, puddling, paving,	5,238 00
198—164,	232.82,	Much variety of ground, though the principal part is easy of excavation:	
Amount carried	forward,	- - - -	$ 457,728 00

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* This creek is not noticed in Moore's report.

† The falls at this place appear to be the only eligible spot for a feeder to be taken from James river; it is, however, too near the end of the canal, especially if this should be stopped above *Licking-hole creek.* It is presumed that it will not be wanted, and that the tributary streams above this point will be adequate to maintain the supply.

Stations.	*Distances in 4 pol chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - -	457,728 00
		for excavation, some embankment and puddling 3 farm bridges, 2 wastes,	19,320 70
		Two culverts,	1,330 00
		Two locks of 7 feet lift each,	13,720 00
		Total amount,	$ 492,098 70

The expense of the 22d Map is consequently $ 142,689 40
And with the addition of 10 per cent. for contingencies, &c. 156,958 00

23d and last Map.—Extending down to below the guard-lock of the canal below MAIDEN'S ADVENTURE FALLS.

Distance by the Canal 10.60 miles.
Lockage - 27.25 feet.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 164 to 159,	35.02,	Pretty good ground: excavation, some embankment and puddling,	1,936 20
		At this point the canal approaches near the river, and it is presumed that the pond of the dam at Maiden's Adventure Falls commences. The expense of the continuation of the canal below would be so considerable, that it may be expedient to take the river here. If the canal terminated here, the expense of the section would be $ 494,034 90	
		To which add for lockage, as below, 27,860 00	
		Total, exclusive of contingent expenses, $ 521,894 90	
unt carried	forward,	- - - -	$ 494,034 90

Amount brought forward, - - - - - 494,034 90

The following estimate of the continuation of the canal, will shew what saving would be produced by taking the river at this place, which is nearly 9 *miles above* MAIDEN'S ADVENTURE FALLS.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	
From 159 to 108, (M. 967,)	406.75,	Ground in general good, though stony at first. Many ravines are crossed, as well as *Rocky Run*, *Gunner creek*, *Big* and *Little Licking-hole* creeks, which occasion much expense in embankment, culverts, &c.:* for excavation, embankment, puddling, 6 bridges, 2 wastes,	47,165 90
		5 culverts over *Rocky Run*, *Gunner's Creek*, *Little Licking-hole* and two other runs,	6,900 00
		One aqueduct of 30 feet span over *Big Licking-hole creek*,	7,500 00
		One lock of 7 feet lift,	6,860 00
108—74, (M. 967,)	95.98,	Along irregular cliffs at an elevation of 20 1-4 feet above the pond of the dam, which is 7 1-2 feet average depth, and will increase the difficulty of building the bank of the canal —(N. B. The dam had not been made at the time of the survey): for some excavation, much embankment, puddling, paving, one waste,	43,927 40
		2 small culverts,	1,580 00
74—46, (M. 1015,)	152.85,	Over ground mostly good, though rocky in places: for excavation, embankment, puddling, one bridge, 2 wastes,	13,380 40
		One culvert,	1,800 00
46—30, (M. 1015,)	45.66,	Along a rugged rocky hill side 20 1-4 feet above the pond of the dam, which averages 6 1-2 feet deep where the bank of the canal should be built; for some excavation, much embankment and puddling, some paving,	28,260 40
		3 culverts,	3,730 00
		Which is at the rate of 701 dollars per chain.	
30—1,	115.88,	Ground mostly good; this distance ends at the canal below the guard-lock at Maiden's Adventure: for excavation,	
Amount carried forward,		- - - - -	$ 655,139 00

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* These creeks are not noticed in Moore's report: *Licking-hole Creek* is mentioned in Briggs' report, and recommended to be taken in by a dam and used as a feeder. It seems ill calculated for either plan.

Stations.	*Distances in 4 pol. chs.*	*Observations.*	*Expense.*
Amount brought	forward,	- - - - -	655,139 00
		embankment, puddling, 2 bridges, 2 wastes,	12,910 20
		One culvert,	950 00
		Three locks of 6 75-100 feet each ; the last one being more expensive than the others on account of deep cutting and probable difficulties of foundation,	21,000 00
		Total expense of the section,	$ 689,999 20

And with the addition of 10 per cent. for contingencies, &c. $758,999 00
Which is at the rate of 17,091 dollars per mile of the canal.
The expense of the 23d Map is 217,691 dollars.

If the river was taken near station 159, the expense of the section, (see page 430,) would only be $521,894 90, to which, adding 10 per cent. for contingencies, &c. and then deducting the whole from the above amount, the difference, $ 184,900, would be the saving obtained, which may be reduced to 184,000 dollars to allow for some additional difficulty in building the foundation of the lower lock under the level of the river. As to the making of a tow path in this case, it would be about balanced by the difference in the condemnation of property and in fencing. The inconvenience occasionally experienced in using the river, would not probably be thought, at least for a long time, sufficient to justify the additional expenditure requisite to make the independent canal along this difficult ground.

RECAPITULATION

OF THE ESTIMATE OF

EACH MAP AND SECTION

FOR AN UNINTERRUPTED CANAL

FROM

COVINGTON TO MAIDEN'S ADVENTURE FALLS

1*st Section.—From* COVINGTON *to* RICH-PATCH FORD.

Maps.	*Distance in miles.*	*Length of each section.*		*Estimated expense of each Map.*	*Expense of each section.*		
		By the canal.	By the river.		Aggregate.	*Per mile.*	
						Of the canal.	Of the river.
1st,	7.37,	-	-	$ 205 893,			
2d,	8.69,	-	-	379,957,			
		16.06,	21.06,		$ 585,850,	$ 36,478,	$ 27,818

2*d Section.—From the* RICH-PATCH MOUNTAIN *to the* NORTH BRANCH.

3d,	9.42,	-	-	235,854,			
4th,	10.50.	-	-	195.416,			
5th,	10.75,	-	-	336,887,			
6th,	8.92,	-	-	229,807,			
7th,	3.50,	-	-	80,105,			
8th,	10.90,	-	-	285,007,			
		53.99,	60.50,		1,363,076,	25,247,	22,530

3*d Section, and beginning of the* 4*th Section.—In construction through the* BLUE RIDGE *from the* NORTH BRANCH *to* PINEY ISLAND.

9th,	7.00,	Not included in this estimate.

Continuation of the 4*th Section.—From* PINEY ISLAND *to* JUDITH'S CREEK.

Maps.	*Distance in miles.*	*Length of each section.*		*Estimated expense of each Map.*	*Expense of each section.*		
						Per mile.	
		By the canal.	By the river.		Aggregate.	Of the canal.	Of the river.
9th,	3.70,	-	-	$ 66.152,			
10th,	10.16,	-	-	326,723,			
11th,	2.59,	-	-	80,886,			
		16.45,	16.00,	-	473,761,	28,800,	29,610

5*th Section.—From* JUDITH'S CREEK *to* JOSHUA'S FALLS.

Not yet surveyed.

6*th Section.—From* JOSHUA'S FALLS *to* TYE RIVER.

11th, 12th, 13th, 14th, 15th,	not surveyed.	43.50,	43.50,	probable expense of both sections.	890,000,	-	20,460

7*th Section.—From* TYE RIVER *to the* SEVEN ISLAND FALLS.

16th,	9.31,	-	-	117,187,			
17th,	8.25,	-	-	151,721,			
18th,	9.99,	-	-	119,300,			
19th,	10.16,	-	-	205,878,			
		37.71,	38.34.	-	594,086,	15,754.	15,495

8*th Section.—From the* SEVEN ISLAND FALLS *to the canal at* MAIDEN'S ADVENTURE FALLS.

20th,	11.21,	-	-	163,198,			
21st,	11.30,	-	-	221,152,			
22d,	11.30,	-	-	156,958,			
23d,	10.60,	-	-	217,691,			
		44.41,	44.00,	-	758,999,	17,091,	17,250

Total distance unimproved, The canal will be about 11.28 miles shorter than the river.	212.12,	223.40,	probable expense of the whole improvement.	4,665,772

The expense may be stated at - 4,750,000

To allow for the condemnation of property and for fencing—

It would be reduced to about, - - - - 4,563,000

If the pond of the dam at Maiden's Adventure was used—by deducting 184,000 dollars, as stated in page 432, and also 3,000 dollars for condemnation and fencing in the 9 miles.

The preceding table shews that the probable expense of completing the independent canal from Maiden's Adventure to Covington, would be - - $4,750,000
To which, if the expenditure of the sections already made is added, the whole cost of the improvement of James and Jackson's River by an uninterrupted canal from Richmond to Covington, when completed,
Would amount to about - $5,750,000

I am confident that, with proper management, and under the superintendence of an able and in every respect well qualified officer, the cost of this great work upon the contemplated scale would not exceed the sum here stated. As to the effect which the aberrations of agents may have on the expense of public works, no one can pretend to introduce it into an estimate; it is incalculable: though the importance and influence of a competent direction of such works is not, in general, sufficiently appreciated. The imperfections of works have too frequently the unhappy effect of discouraging the public, because they are most generally laid upon the nature of the undertaking, instead of being attributed to their true cause. To combine and balance beforehand all the elements of an extensive and complicated work, so as to secure its utility, without exceeding the exact quantity of labour or materials requisite for its perfect execution, there is need of more skill and information than is usually supposed; and, for want of it, much expense is often unnecessarily incurred, and very frequently too in consequence of false economy.

As regards the estimated expense of the continuation of the canal, it may be remarked, that it is not in proportion to the cost of the sections which have already been made. This difference results from several causes: the canal near Richmond is 40 feet wide, whereas the law requires its continuation to be only 30 feet wide; it has four feeders in a distance of thirty miles, two of which have been very expensive; it contains five guard-locks and other extra works; a considerable extra expense has been incurred in widening and deepening the old canal; the locks are larger and otherwise more expensive than they should be above; every thing is dearer near Richmond than in the upper counties; and lastly, the work has been divided into small contracts, which, at the same time that they are necessarily unprofitable to contractors, are probably still more disadvantageous to the State.

As to the canal through the gap at the Blue Ridge, I need not add any thing here to what I have said in my preceding reports to shew, that I do not consider this work as a criterion of the cost of the continuation of the improvement.

Many, not improbable circumstances, may even reduce the cost of the canal below the above estimated sum. The price of labour has greatly diminished in some States, and may possibly be affected in the same way in Virginia; hydraulick lime will, in all probability, be discovered in the State; an examination of the limestone district for this special purpose, would be of great importance; not only the discovery would benefit the works that will hereafter be undertaken, but it would procure to the State a valuable article of trade. The price of common lime and of other materials will likewise probably experience a diminution, as the improvement of the river progresses, and the facilities of transportation increase.

When this improvement is resumed, it should be carried at once to some great place of deposit, such as Lynchburg, and prosecuted with vigour; for, it is obvious that the benefit of the improvement will be but partially and imperfectly felt, until it shall be so extended as to allow of the application of horse power to the towing of large boats. So long as there remains an unfinished link of the improvement between Lynchburg and Richmond, the present batteaux must continue to be used above the Coal mines; their tonnage cannot be increased, nor the number of hands in them diminished: the time of performing a trip likewise cannot be materially reduced, and therefore nothing but a greater degree of safety can be expected to be gained by a partial improvement; and, as under such circumstances, the present expense of transportation would not admit of much reduction, the trade could not be taxed with adequate tolls to defray the expense of the work before its entire completion.

But, let a slack water navigation be extended rapidly from Richmond to Lynchburg, then boats of from 20 to 25 tons drawn by one horse, with a man and a boy, will immediately come into use: Such boats will perform a trip between Lynchburg and Richmond and back in about 15 days, which, at $ 3 a day, would be an expense of $ 45 for the whole trip.

From the enquiries I have made, it appears that the ascending trade is only about one-fourth of the descending one; so that a boat, after having brought down 20 tons, would, upon an average, return with a load of about 5 tons; which is 25 tons transported during the whole trip of 15 days. The account for which would stand thus:

For transportation of 25 tons, - - -	$45 00
Which is per ton, - - - -	1 80

The present trade is carried on in small batteaux, each employing three hands; it does not appear that upon an average the load transported in a trip from and to Lynchburg, is more than 6 tons; the trip is performed in about 22 days. The hire of the boat and three hands being about $ 2 50 per day, the expense of the whole trip will be $ 55.

$ 55 for 6 tons, are - - $ 9 10* a ton, which shews a difference of $ 7 30 in favour of an improved navigation: so important a reduction in the freight would enable the trade to bear considerable tolls, which would be gladly paid for the advantage of a safe, regular and convenient navigation.

Lynchburg is the emporium of an extensive and fertile district; and the navigation of James river is so much dependent upon its trade, that the first step of its improvement, of whatever nature it may be, could not be attended with any very beneficial result, if it stop short of this place; and there appears to exist no reason to doubt, that the trade up to that point would be sufficient to pay a reasonable dividend on the capital expended in such improvement. From facts collected by a gentleman who took great pains to ascertain the extent of the present trade of James river, it appears that, on an average of five years prior to 1824, a quantity of 34,224 tons of produce and merchandize, exclusive of coal and plaster, was transported on James river, one half of which is supposed to have been from and to Lynchburg.

Admitting, therefore, that this half is taxed with tolls at the rate of $ 6 per ton, which is justified by the above calculations, and will leave yet at least $ 1 30 in favor of the trade; and, supposing also that, in the same proportion, the other half is made to bear an average of $ 3 of tolls on each ton, the whole amount collected would be - - $ 154,000

The quantity of coal that passed through the locks last year was 400,000 bushels, the tolls upon which, at the present rate, would be - - - $ 4,000
which being added to the above sum, give $ 158,000
for the revenue that may be relied on from the existing trade.

A good canal improvement should yield 8 per cent. upon the capital expended; the whole canal from Richmond to Lynch-

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[*] I have seen various statements, which make the average freight from Lynchburg to Richmond $ 6 80, $ 10 20, and even $ 12 80; there is probably much fluctuation in this item: I have therefore thought it best, to establish the price from the average hire of a boat and 3 men, which gives very nearly a mean between the statements just quoted.

burg, according to the above estimate, and including the expense of the section below Maiden's Adventure,

Will cost - - -	$2,750,000
The interest of which at 8 per cent. is -	220,000
From which deducting the above sum -	158,000
The balance will be - -	$ 62,000

Which will have to depend on the increase of trade produced by the improvement.

I am not possessed of sufficient data to form any exact calculation of the resources which now lie inert, but would be set in operation by the impulse a perfect navigation would give to the trade: such calculations must be based on minute enquiries and an extensive statistick knowledge, which the multiplicity and different direction of my duties have not allowed me either time or opportunities to obtain.

But fortunately, here we are not left to depend altogether on gratuitous suppositions: several improvements are either in progress or in contemplation, whose object is to open communications with the trade of James river, and from which it will receive important accessions. We may soon expect to see the extensive waggoning heretofore carried on between Staunton and Richmond, take a new direction along the turnpike now in construction, to empty itself at the small town of Scottsville into the boats of James river. This town may perhaps ere long acquire like Lynchburg, a considerable degree of influence on the trade of James river.

Improvements on the Rivanna river are very earnestly contemplated, and from the growing importance of Charlottesville, must be expected soon to be carried into execution. Then the James river trade will extend its ramifications through Albemarle county, to Orange and even Rockingham counties, and reach farther and farther, as from these combined causes, capital increases.

At the same time that the facilities afforded by an improved navigation will encourage and multiply these lateral improvements, they will, likewise, greatly contribute to increase the trade to the west. I have been credibly assured, that even in the present state of things, transportation from the northern towns by way of Richmond and Lynchburg to the States of Kentucky and Tennessee, is from $ 1 50 to $ 2 per hundred cheaper than from Baltimore direct along the national turnpike.

May it not also be reasonably expected, that when large boats can be used and horse power applied to them, much coal will find a market up the river and constitute a valuable return trade. If all these considerations be duly weighed and estimated, can it be doubted that the augmentation of trade will be sufficient to furnish the additional revenue of $ 62,000 necessary to produce a competent dividend on the cost of the improvement? This sum is only a little more than one-third of that which will certainly be produced by the present trade, and would perhaps be raised, upon the mere augmentation of commerce along the margin of the river alone.

Moreover, it may be recollected that the estimate of the cost of the canal here presented, supposes it to be uninterrupted, and that it has been suggested that a considerable sum might be saved by taking the head of the pond above Maiden's Adventure Falls: Supposing, therefore, this to be done, the interest on the sum saved, ($ 187,000,) at the rate of 8 per cent. would be about - - $ 15,000
which ought to be deducted from the amount requisite to pay an adequate dividend upon the capital. This subtraction from the above balance of - - $ 62,000
would leave only - - 47,000
to be raised upon the increase of commerce, which need not be quite as much as one-third of the present trade to secure this result.

We may safely, therefore, adopt this satisfactory conclusion: that the revenue of the trade between Lynchburg and Richmond, would soon be more than adequate to pay a reasonable dividend on the cost of the most complete kind of improvement, and that in a few years the surplus revenue would probably be such as to allow of a reduction of the tolls to the greater encouragement of the trade, or else it might be appropriated to the extinction of the debt.

In all the foregoing calculations, it will appear, I think, that I have kept on the safe side. In stating the tolls at $ 6, while the economy resulting from a meliorated navigation was proved to be at least $ 7 30, I have still left a saving of $ 1 30 per ton to the trade between Lynchburg and Richmond. But the benefits which would accrue from the improvement are not confined to this sum: the certainty of arrivals, which would lessen the fluctuation of prices; the possibility of making large loads; the greater degree of responsibility of head-boatmen; the diminution of risks; the probable reduction of storage and commission, resulting from several of these causes, are circumstances which, though they cannot be readily reduced to numbers, will add to the profits of the grower of produce and of the merchant.

From Lynchburg to the mouth of the North Branch of James river, which is the next important point, the distance is 28 miles; the ground is very unfavorable to the making of a canal, the cost of which, including that of the work in progress through the Blue Ridge, would not fall much short of one million of dollars. The seven miles of canal at the Gap were indispensable: but, below this point, down to Lynchburg, the fall being much less and the ground so bad as to render the permanency of a canal very difficult to secure, the question naturally occurs, whether a cheaper mode of improvement would not be as advisable in that distance.

A great deal of produce may be expected to be collected at the mouth of the North Branch. Pattonsburg, which is 20 miles higher up, will also become a considerable depot; but the ground between this town and the North Branch offers great difficulties; and it is doubtful whether the superiority of a canal navigation over one by locks and dams would, in so short a distance, compensate for its great expense; especially as above this town the nature of the country does not appear to justify the expense of a canal, through ground so rugged and uncultivated, unless it should be as a necessary link of the great connexion which has for many years been contemplated by the State of Virginia, between the Ohio and the Atlantic, by James river and the Kanawha.

Some doubts, however, may be entertained as to the expediency of prosecuting this great scheme upon the extensive scale heretofore contemplated, since the project of uniting the Ohio and Chesapeake has been found practicable by the engineers employed by the general government. Two parallel lines of canal intended for the same object, will always injure each other: but, here the case would be particularly unfavorable to the James and Kanawha route, which, if the Ohio and Chesapeake canal should actually realize the expectations that have been formed, and extend its commercial influence to the Western States, could not, with a portage of a hundred miles, enter into competition against a continuous canal, possessing the superior advantages which the means of the general government can give it. Until, therefore, the question relative to the Ohio and Chesapeake canal shall have been decided, it may be prudent to suspend the execution of the scheme of connecting the Ohio and the Atlantic through the State of Virginia, upon the scale originally intended. Yet, on the other hand, we have a road leading from the Kanawha river to Covington, and no outlet at this latter place. To improve, for the present, the navigation of Jackson's river, and of the upper part of James river upon a cheap plan, in order to promote the trade over the turnpike, and give it, as soon as possible, its direction into this natural channel, appears to be recommended by the state of things. A sluice navigation promises even less advantages on this rapid part of the river, than on any other. The next order of improvement is consequently deemed the most expedient; that is to say: a system of locks and dams upon as economical a plan as can be devised; in order that, when the increase of the trade shall shew the propriety of a more permanent mode of improvement, it may be carried into effect upon the plan then deemed most eligible, without having to regret the expense before incurred; since, after the lapse of a few years, it would prove much less than would otherwise have been, during the same time, the accumulation of interest on the expenditure of a complete improvement constructed at an early period, when for a long time it would be altogether disproportionate to the trade. This I think I have clearly demonstrated in the letter I addressed last winter to a gentleman of your body, in answer to some inquiries relative to the navigation of Jackson's river, and which has been printed with the account of your proceedings: to this letter I beg to refer for a more complete developement of the subject.

I am aware, that the plan here suggested was objected to in the House of Delegates by a gentleman whose opinions would probably have much weight in these matters: it cannot be expected that I should answer in detail to arguments urged against my views or reports: if convinced by them, it would be my duty to yourselves and the public to yield up my opinion, and I would readily do it: otherwise, an expression of the same opinion, though presented under perhaps another shape, would, in most instances, make official reports the mere channel of private controversies. I will confine myself, therefore, here to say, that after having given due consideration to the arguments used in the case, my opinion remains unaltered as to this improvement and its cost; and that my views in this business must, very probably, have been misunderstood. At the same time that I will admit, that a *permanent* and *substantial* improvement by locks and dams would greatly exceed the expense at which I stated that of Jackson's river, I am convinced that an improvement to answer present purposes, *such* *as expressed in the letter referred to,* could be made for about the sum mentioned in the same.*

Though in general averse to temporary improvements, still in this particular case such a one appears to me most expedient; in order that the trade of that district, and especially of the turnpike, may be encouraged and assisted at as little an expense as possible, until this trade shall have acquired some developement; and whilst the question relative to the Ohio and Chesapeake canal and the communication by James river and the Kanawha remains in its present state of indecision.

Here the enquiry naturally suggests itself, whether the connexion between the Ohio and Chesapeake offers decidedly greater advantages than the route by the James and Kanawha rivers? This question must be considered under two different points of view, viz: The comparative degree of practicability of both routes, and their relative expediency and advantages.

Two years were employed in exploring the dividing ridge of the Ohio and Chesapeake canal: the result of the first year's examination was that, by opening a tunnel 227 feet below the top of the ridge, there would be 3,837 feet of lockage on the route. On the Kanawha and James river line of connexion, deducting as above 227 feet from the elevation of the ridge, on either side, the lockage would be 3,913 feet on the only route explored, and according to the statement of I. Briggs; shewing but a small difference of lockage.

As to the ground over which the Ohio and Chesapeake canal must pass, from what I have seen of it and from the documents which the public has been put in possession of, it is doubtful whether it could be worse any where: difficulties of the first magnitude would have to be encountered on the route described in the Report of the Board of Engineers.

As regards the supply of water, it was considered amply sufficient on the Deep Creek route, though it could not be obtained without much labour and expense.

The operations of the second year had, for their object, the examination of a new route between the Casselman river and Will's creek, which, in the Report of the Board of Engineers of last year (1825), had been represented as possessing some advantages, but as requiring farther examination: their impression then was, that the supply of water on this route would be scanty. It is said, however, that the operations of the second year have given a more satisfactory result, and that there exists a sufficiency of water on this new route, which has besides the advantage of being 400 feet lower than that by Deep creek, and about 26 miles nearer; it is nevertheless added, that, should it be found necessary, the whole supply of the Deep creek summit might be transferred to the new summit by a feeder.

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* In the statement of the fall of Jackson's river, an error of 10 feet was made in e said letter: it has been since corrected in a note annexed to it.

From the foregoing account it will appear, that the surveys of the first year did not disclose the most advantageous and important circumstances of this route; yet three parties or *brigades* of Engineers were employed in the operation: two of these consisted of sixteen officers, the third was composed of one Civil Engineer and five assistants, in all twenty-two Engineers or Surveyors.

Had the Alleghany Mountains in Virginia, been searched for two successive years, with the same persevering diligence, and by a party as numerous, the result might perhaps have been as different from what is now known, as the survey made by the U. S. Engineers the second year, was from their first examination. In Virginia, only two Chief Engineers and four assistants were employed; and, in one season, they located a road of 94 miles in length: they surveyed Craig's creek, Sinking creek, Dunlap's creek, Ogley's creek, Howard's creek, Greenbrier river, New river, the Kanawha and James river. Such an extent of surveys must have left them but little leisure to explore thoroughly the mountains between James river and the Kanawha, to gauge creeks and sources, trace the route of feeders, ascertain the size of reservoirs, measure the probable length of tunnels: and, in one word, perform all those necessary and minute operations from which alone a decisive opinion of the practicability of such a scheme can be formed. It does not appear, therefore, that the examination which has been made, can be entirely satisfactory;* and I should be inclined to think that judgment premature, which should pronounce the route by the Kanawha and James river impracticable: I have, indeed, heard it affirmed, that there was a much lower place through the Alleghany mountain than that through which the survey was conducted, and that a sufficiency of water may be had.

Should it be confirmed, by an actual survey, that such a low place exists, and that it could be supplied with water, the connexion of James river and the Kanawha, in point of practicability, would not yield to the projected Ohio and Chesapeake canal: for, the difficulties of the ground would, most probably, be rather less than greater here; and the length of the canal could not differ much on either route.

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* Since I wrote this, I have had a conversation with a gentleman who was engaged in the survey, which fully confirms the opinion I had formed: from the shortness of the time allotted to the examination it appears to have been very limited and incomplete.

Having submitted the foregoing observations on the practicability of the two lines of connexion between the western and eastern waters, I will now proceed to examine the question relative to the policy and importance of both routes. Although I conceive it my duty to present every consideration which, in my opinion, may have a bearing on the expediency of the scheme which is the object of this report, I cannot but feel a considerable degree of diffidence, when I have to discuss a subject fraught with so much importance, and out of the sphere of my professional pursuits. Imperfect as my knowledge is of the mutual interests of the different States of the Union, I would not presume to give an opinion in this matter. I only wish to call the attention of more competent men to a few observations and enquiries relative to this subject, which cannot be better introduced than by some extracts of the able report of the Secretary of War, in date of the 3d December, 1824, which explains the views of the General Government in regard to the internal improvements which, for two years past, have occupied the attention of the U S. Board of Engineers. The Secretary of War expresses himself as follows: "It became "necessary in giving orders to the Board under the act, to de-"termine what routes for roads and canals were of '*national* "*importance*' in the views contemplated by the act; as such "only as the President might deem to be of that description, "were authorised to be examined and surveyed. In deciding "this point it became necessary to advert to our political sys-"tem in its distribution of powers and duties between the Ge-"neral and State Governments. In thus regarding our sys-"tem, it was conceived that all of those routes of roads and "canals, which might be fairly considered as falling within the "province of any particular State, however useful they might "be in a commercial or political point of view, or to the trans-"portation of the mail, were excluded from the provisions of "the act.

* * *

"In projecting the surveys in this view of the subject, the "whole Union must be considered as one, and the attention "directed not to those roads and canals which may facilitate "intercourse between parts of the same State, but those which "may bind all of the parts together, and the whole with the "centre; thereby facilitating commerce and intercourse among "the States, and enabling the Government to disseminate "promptly through the mail, information to every part, and "to extend protection to the whole. By extending those "principles to the line of communication by roads and canals "through the States, the General Government, instead of interfering with the State Governments, within their proper "spheres of action, will afford (particularly to those States situated in the interior) the only means of perfecting improvements of similar description, which properly belong to them.

"These principles being fixed, it only remained to apply "them to our actual geographical position to determine what "particular routes were of '*national importance.*'

* * * *

"The first and most important was conceived to be the route "for a canal extending from the Seat of Government by the "Potomack to the Ohio river, and thence to Lake Erie.

* * * *

"There are several other routes which, though not essential "to the system, are deemed of great importance in a commer-"cial and military point of view, and which the Board will "receive instructions to examine: among these, the most prominent is the connexion, wherever it may prove practicable, "of the eastern and western waters, through the principal rivers discharging themselves into the Atlantic and the Gulph "of Mexico; for example, the Alabama and Savannah rivers "with the Tennessee; James river and the Kanawha; and the "Susquehanna with the Alleghany; which last will be more "particularly adverted to in a subsequent part of the report.

* * * *

"The Board have, besides those already mentioned, examined, in conjunction with Pennsylvania Commissioners, a "route for a canal from the Alleghany to the Susquehanna. "In addition to the importance of this route to a large portion of the west and the State of Pennsylvania, it was thought "to possess other and strong claims on the attention of the "Government; it is believed to be one of the most promising "routes to cross the Alleghany by a canal communication; and, "should that by the Potomack prove impracticable, it might "afford the means of effecting the great object intended by "the canal projected by that route."

In reading this document, it will be perceived that the connexion between the James and Kanawha rivers is not considered as one, *that will only facilitate intercourse between parts of the same State;* but, that it is *deemed of great importance in a commercial and military point of view, though not essential to the system* of internal improvements of *national importance.*

It is further said in the same report: "The great canal of "New-York, firmly unites the country of the Lakes and the "Atlantic through the channel of the North river; and the na-"tional road from Cumberland to Wheeling unites, but more "imperfectly, the western with the Atlantic. But the com-"plete union of these separate parts, which, geographically, "constitute our country, can only be effected by the comple-"tion of the projected canal to the Ohio and Lake Erie, by "means of which the country lying on the Lakes will be firm-"ly united to that on the western waters, and both with the "Atlantic States, and the whole intimately connected with "the centre."

The northern States are considered as firmly united by the New York canal; the national turnpike is deemed an imperfect tie, and it is purposed to strengthen it by a canal on nearly the same track; and, if this should prove impracticable, it is recommended to seek for another connexion of the eastern and western waters by the Susquehanna and the Alleghany rivers, betwixt those two already established communications.

But, would not so many commercial facilities accumulated in the northern States be an injury to each other? Would not a canal between the Susquehanna and Alleghany approach too near the New York canal to be an undertaking sufficiently profitable and advantageous to justify an expenditure of perhaps $20,000,000? Would there not be much inducement for a boat passing before the mouth of Big Beaver, (a little below Pittsburg,) to go up this river and along the canal which, as part of the grand scheme, is purposed to connect Big Beaver with Lake Erie; and thence to seek the New York market, instead of ascending the Monongalia and passing over the high summit of the Alleghany mountain to reach the Susquehanna?

But I go farther; would not the case be nearly the same as regards the Ohio and Chesapeake canal? Let us conceive that a boat loaded with produce has reached the mouth of Big Beaver; two routes would lay before it, one leading to New York, the other passing by Pittsburg over a high mountain and leading down the Potomack to Washington City and thence to the mouth of the Chesapeake: which of these two courses would most commonly be selected? Let us cast a glance at the Map, and, if I am not much mistaken, the question will be answered without hesitation.

If my recollection is correct, when the route of the Ohio and Chesapeake canal was first surveyed, no step had been taken in the State of Ohio towards the opening of canals. But now she is constructing one between the Scioto and the Lakes, which will bind her interest and that of the adjoining States to New York, by commercial ties: this canal passes through the very centre of her territory. Does not this improvement give a new aspect to the view which was previously taken of the connexion between the Ohio and the Atlantic? Is it to be presumed, when this canal is completed, that the trade will descend the Scioto, ascend the Ohio to Pittsburg, and thence cross the Alleghany to descend into the Potomack? If it does not, the trade of the greater part of the State of Ohio will be lost to the Ohio and Chesapeake canal.

While the Map is before us, let us follow the course of the Ohio, and this enquiry will be naturally made: whether there would not be much inducement for the trade of the middle States to follow the same course and reach the Lakes and New York by way of the Scioto, instead of continuing to ascend the Ohio towards Pittsburg, thence to overcome the immense lockage of the Alleghany mountain and descend into the Chesapeake? Should this take place, and should also the connexion of the Ohio by Big Beaver with the Lakes divert from the Ohio and Chesapeake canal, the trade of the country lying on the Ohio, north of the mouth of the Scioto, the country bordering on the Potomack and its tributaries would be left to contribute alone towards defraying the expense of a stupendous work, which is estimated at not less than twenty millions of dollars. (See the report of Mr. Stewart, of the committee on Roads and Canals, May 22d, 1826.)

The tendency of the trade will always be towards the greatest quantity of capital; and, in this respect, the New York market will probably for ever preponderate. But, I will admit, that from some cause which I have not duly appreciated, a preference would be given to the Ohio and Chesapeake canal, over the other water communications leading to the Lakes; and it may still be questioned, whether a canal from the Kanawha to James river would not intercept the greater part of the trade of the valley of the Ohio.

Let us suppose that a canal has been made from Pittsburg to the Chesapeake, and that there is also a canal between the Great Kanawha and James river; if we imagine a boat ascending the Ohio, would it pass the mouth of the noble Kanawha unheeded? And, would the produce be carried the whole way up the Ohio to Pittsburg, and thence pass over the Alleghany mountain to the Potomack, to find itself ultimately at the entrance of the Chesapeake, opposite the very mouth of James river, having travelled an additional distance of about 250 miles of ascending navigation on the Ohio, when, at least this distance might be saved by taking the Kanawha and James river route?

The trade of the States of Tennessee and Kentucky, and also of the southern part of Ohio, would most probably seek this shorter channel, which opens nearly opposite the mouth of the Scioto; and even some of the produce of the upper part of the Ohio river would be floated down the stream towards the Great Kanawha, in preference to ascending towards Pittsburg: and the attraction of the Lakes and New York would very likely not be felt to that distance, because here would be a much shorter route, and also less liability to interruption from ice than on northern canals.

In a commercial point of view, therefore, I cannot help thinking that the connexion of James and Kanawha river would prove more useful and profitable than the union of the waters of the Ohio and the Potomack, and that its beneficial results would be more distantly felt and diffused. It would promote the commercial interest of the middle and western States and bind them together, and also, with the country lying on the Lakes, by its immediate proximity to the Scioto and the Muskingum.

Considered in a military point of view, it may likewise be asked whether James river is not as important as the Potomack or the Susquehanna? Its entrance will be effectually defended by the cross fires of the two formidable forts at Old Point Comfort and the Rip-raps, which will afford complete protection to the coasting trade. As an interior line or base of operations, the central situation of a safe water communication between James river and the Ohio, would, I think, offer incalculable advantages.

If the considerations I have presented here are correct, it is o be regretted that no complete examination has been made f the dividing summits between the James and Kanawha rivers; a well conducted survey to ascertain in a conclusive manner the degree of practicability of a canal across the mountains, by dispelling the doubts which hang over this great question, would be of the highest importance, not only to the State of

Virginia, but to several of the western States. Should the scheme be demonstrated by such an examination and survey to be quite practicable, (and it will not appear improbable that it would be found so, when it is considered how near some of the sources of both the eastern and western waters approach to the top of the dividing ridge,) it would have an immense influence on the view which should be taken of the improvement of the upper navigation of James river.

The last remark I have to make on the canal, is relative to its connexion with tide water. The old decayed locks at the lower end of the basin cannot be maintained much longer: it would appear expedient to replace them by a line of stone locks beginning somewhere near the Armory and terminating at the Dock, some distance below Mayo's bridge, with suitable basins between them: they might probably be made for $100,000. This improvement, with proper accommodations at the Dock, would greatly benefit the coal trade; it would diminish the cost of that which is exported, in consequence of which the increased quantity of this article, which would then come to Richmond, would very likely be alone sufficient to pay a fair interest on the expenditure: The Dock itself, in which the State is largely interested, would likewise be benefitted. And we must besides anticipate the time when, the improvement of James river being completed, the increase of business and the certainty of arrivals will make it a great object to meet the shipping with the canal boats.

ON THE IMPROVEMENT OF THE

RIVER BY LOCKS AND DAMS, AND BY SLUICES.

Having, in compliance with your order, laid before your honorable Board all the considerations which suggested themselves to me in regard to the prosecution of the *canal* along the margin of the river from Maiden's Adventure to the mouth of Dunlap's creek, I will conclude this report by an enquiry into the relative expediency and advantages of other modes of improvement, which, though not positively required by your resolution, may be considered an implicit and indispensable appendage of the report.

I should, however, say but little on the subject, if I had to make a comparison between the navigation of rivers with boats managed by men, and that of canals with boats propelled by horses. Experience has long since decided the question in favour of canals; and the principal objection to the improving of the bed of rivers, has always been the want of a suitable propelling power. But the introduction of a new, powerful and locomotive agent will lead me to consider the various modes of improvement under a different point of view.

In this age of discovery, the application of steam as a moving power, has produced a revolution in the mechanical arts. To this powerful agent we owe the advantage of a convenient, expeditious and safe mode of navigation: but its application as yet, has been confined to deep and comparatively still waters. Of late, however, some attention has been given to its introduction in the various systems of internal improvements. On the Susquehanna, experiments have recently been made to ascertain the practicability of applying the steam engine to sluice navigation. A steam-boat (the Codorus) has ascended the Susquehanna up to the mouth of the Chenango. Of the capability of steam-boats to ascend a river, there could have been no doubt: for, the question being reduced to this simple statement: if a steam-boat would move in still water at the rate of 10 miles an hour, for instance; could it stem a current of 4, 5 or 6 miles an hour, and how fast would it do it? the answer could not be doubtful. The possibility of ascending a stream is not, therefore, the principal question to be investigated; but, rather, whether the application of steam power to sluice navigation will, in all cases, be attended with real benefit; and also, whether it could, advantageously, be introduced on a river improved by locks and dams.

As to canals, experience has taught that steam is not easily applicable to their navigation, and that it would require that they should be made of dimensions and in a manner different from their usual construction; and also on a more expensive plan.

The principal aim of all the improvements in navigation is to obtain the most advantageous application of the most economical propelling power: and the chief advantage of a canal consists in the facility of using horses in the towing of boats, which cannot be employed in sluice navigation, and are seldom advantageously so in lock and dam navigation: the power of a horse being equal to that of at least 6 men and much cheaper, this circumstance alone would make canal transportation a great deal less expensive than the navigation of a river. But, if steam could be used as a propelling power, it is obvious that a lock and dam improvement might be advanced towards an equality with a canal. It is this important question that I now purpose to investigate. As the suggestion is of recent date, experience has not yet furnished precedents from which to draw positive deductions: it is necessary, therefore, to recur for information on this head to the very fundamental principles and data on which it depends, and to proceed in this investigation with cautious steps.

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INTRODUCTORY REMARKS ON THE USE OF STEAM IN NAVIGATION.

The most advantageous way of applying steam-boats to the transportation of produce in open waters, is evidently in towing lighters: the propelling boat in this way draws less water; and the whole train experiences less resistance, than if all the load was collected in the leader. Of the possibility of using steam-boats in this way, there never could have been any doubt. They have been employed for some years past on the Savannah river, on the Cayuga Lake, on Lake Champlain, on the Hudson, and probably on other waters. The only enquiry to be made is relative to their convenience and expense.

Steam-boats of 10 horse power may be made of such dimensions as not to require locks of an inconvenient size. I suppose that they might easily be made to pass through a width of 14 feet, which would not be too great for locks made through dams. This, or even a smaller size of steam-boats, appears eligible, not only as regards the dimension of locks, but for other reasons which I will advert to in the sequel.

I will, therefore, make all my calculations for a boat of this capacity. The process would be the same for other dimensions.

The price of transportation by steam-boats of all sizes in open waters, (that is without locks,) seems to be established generally at about one dollar per ton per hundred miles. On the Hudson, Mississippi and other waters, this is said to be very nearly the rate of freight: the velocity of the boats used averages about 8 miles an hour. This speed is far from being the most advantageous in the transportation of produce or merchandizé; and it is probable that it is assumed for the accommodation of travellers. But, here the subject of enquiry being the carriage of produce, it is proper to determine what should be the speed adopted, and how it would affect the price of transportation.

When a vessel moves in a fluid, it experiences from it a *resistance* which is well known to be *proportional to the square of the velocity;* and consequently, since the propelling power must be increased in proportion to the resistance, it follows, that it would require a four-fold power to move a boat through water with a two-fold velocity; a nine-fold power for a three-fold velocity, &c.; that is, *the propelling power must be increased in proportion to the square of the velocity intended.*

Hence, if two equally loaded boats perform the same trip, one with a velocity of 8 miles, and the other with a velocity of 4 miles an hour, the former will require four times the propelling power of the latter; and, because it will perform two trips while the other makes but one, the expense of its moving power will be double that of the slower boat, and this expense must of course be paid by the freight.

In the same way, if the speed of the first boat was accelerated to 12 miles, the propelling power must be nine times as great: but, on the other hand, performing three trips during the same time, its expense would be three times as great, and so on for any rate of velocity.

From this it must be concluded, that *the expense of a propelling power to move a loaded boat is in direct proportion* *to the velocity given;* or, in other words, *the expense of transporting freight is proportional to the velocity with which it is carried.*

An augmentation of speed may be obtained, either by an increase of power, or by a proportional reduction of weight: but it does not quite follow, that the actual quantity of freight carried would always be exactly in the inverse ratio of the speed of transportation; that is, that exactly half the freight, for instance, would be transported by the same power with double the velocity: in all cases, part of the power is lost in moving the boat and engine (if steam is used) and other things, whose weight must be deducted to obtain the *useful effect* produced by the propelling power; by which deduction, the ratio of the freights corresponding to different velocities is altered to the still greater disadvantage of rapid motion. All these conclusions are verified by daily experience, and instinctively applied to transportation.

The useful effect of a propelling power is, in general, estimated by the product of the freight carried multiplied by the distance to which it is transported in a certain unit of time. The measure of the power itself is usually estimated by the height, to which it is capable of raising a certain weight in a certain time. Thus, in Steam Engines, whose power is generally compared to that of horses, the horse power is most commonly estimated to be equal to 33,000lbs. raised one foot in one minute; or, in another way, 150lbs. raised 2½ miles in one hour. According to this standard, and the foregoing remarks, the freight transported by a steam-boat of 10 horse power at different velocities, would be as follows:

Velocity in miles.	*Useful tons moved.*	*Useful effect in tons moved* 1 *mile.*
2 - - -	- - 400 - -	- - 800
2½ - - -	- - 255 - -	- - 638
3 - - -	- - 175 - -	- - 525
3½ - - -	- - 127 - -	- - 445
4 - - -	- - 95 - -	- - 380
5 - - -	- - 58 - -	- - 290
6 - - -	- - 38 - -	- - 228
8 - - -	- - 18 - -	- - 144
10 - - -	- - 9 - -	- - 90

The numbers in the second column do not include the weight of the apparatus: it has been deducted from the actual freight which would be moved, if the engine was stationary and had not to transport its own weight.

This table shews how much less is to be expected from steam-boats moving with a great velocity than from slower rates. These important results, which are not generally duly appreciated, apply to any other kind of propelling power.

In this, consists the chief disadvantage of sluice navigation; for, if a current run through a sluice at the rate of 5 miles an hour, for instance, it must be stemmed by a power capable of a velocity of at least 6 miles an hour; so that the ascending boat is actually in the same situation as if it moved at that last rate, and consequently is not capable of carrying more than 38 tons, as shewn in the table, if propelled by a 10 horse power; or 3.8 tons by one horse power; or, at the highest estimate, 1 ton if moved by 3 men; and, with that weight, it advances only one mile an hour through the sluice; so that, though there may be many long ponds of smooth water, the intervening of such sluices forbids large loads to be carried on them.

The daily expense of a steam-boat of 10 horse power may be estimated as follows:

30 per cent. on the cost of the boat and engine, valued at $ 3,500, for interest, decrease of value, hazard, renewals and repairs, allowing only 300 working days, - -	$ 3 50
For captain, - - -	3 00
Engineer, - - -	2 00
Two hands, - - -	1 00
Fuel, 1½ cord of wood per day of 12½ hours, or from 15 to 20 bushels of coal, -	3 00
Total for each working day,	$ 12 50

Which, since the boat would perform 100 miles in a day and carry 18 tons, would be about 70 cents per ton per 100 miles.

To this must be added the expense occasioned by delays, stoppages, loading and unloading, which depend on many uncertain circumstances, and on the distance of uninterrupted transportation. Supposing the time lost by these causes to be about one-half the time of travelling, which I think very ample, 35 cents per ton must be added to the above, which will give $ 1 05 for the expense of transporting one ton a hundred miles on slack and open waters. Indeed, some deduction should be made for some fuel saved while the boat is stopped for any length of time; but it is better to err on the safe side. This result agrees nearly with the rate of freight above stated; it would be still less for boats of greater burden, on which the expense of attendance does not increase in proportion to the size.

Having now established the price of transportation in a boat moving at the rate of 8 miles an hour, it is proper to enquire how much it will be reduced by lower rates of velocity.

The expense of delays, stoppages, &c will evidently be less in proportion, when the boat moves slower and carries much freight; but my object being to make a safe estimate, I will still continue to state it at 35 cents per ton per 100 miles.

The expense of transportation alone, being inversely, as the quantity of freight transported during the same time, may be easily calculated by dividing the expense per hour, by the useful effect expressed as above, in tons transported one mile in an hour. The cost of the hour is $ 1 for the steam-boat; and may be estimated for each lighter and the man in it, at 8 cents: Each lighter is supposed to carry from 25 to 30 tons.

The following table exhibits the cost of transportation per ton per 100 *miles for different rates of velocity.*

Velocities in miles per hour.	*Useful effect in tons moved one mile in one hour.*	*Number of lighters.*	*Expense of transportation per ton per* 100 *miles.*	*Do. with the addition of* 35 *cents per ton per* 100 *miles allowed for delays, stoppage, &c.*
8 -	- 144 -	- 0 -	70 cents.	105 cents.
6 -	- 228 -	- 1 -	47 "	82 "
5 -	- 290 -	- 2 -	40 "	75 "
4 -	- 380 -	- 3 -	33 "	68 "
3½ -	- 445 -	- 5 -	31 "	66 "
3 -	- 525 -	- 7 -	30 "	65 "
2½ -	- 638 -	- 10 -	28 "	63 "
2 -	- 800 -	- 15 -	28 "	63 "

This table shews that much is gained by reducing the velocity to 3½ or 4 miles an hour: but a smaller speed, when the load is distributed among lighters, does not seem so advantageous: a train of 7, 10 or 15 lighters would add more to the incumbrance than to the profit.

The expense of transportation here exhibited, would be still less if the distance travelled without interruption was greater, and the trade well regulated; for, then, lighters might be loading while the steam-boat would perform a trip, and be ready to be taken in tow upon its arrival at each place. By this means the sum of 35 cents per ton allowed for delays, stoppages, loading and unloading would be greatly diminished.

I do not think that I have underrated the expense of the steam-boat and lighters; but, even if I had, from the last remark it is obvious, that much might yet be gained by judicious management.

The most eligible degree of speed will of course depend on the nature and quantity of the trade, within the limits, however, of 3½ and 8 miles an hour, which seemed to be fixed by the preceding table.

The size of the steam-boat itself must depend on the trade, the distance of the extreme points, &c. Large steam-boats would, in proportion, be less expensive; but, unless plying between two large and commercial places, they could not make a load so easily. On this account small boats suit best on a river where the trade is not concentrated, as is the case on James river.

In a system of locks and dams, the size of the locks is another consideration which advises smaller dimensions. Boats of moderate size require, besides, less capital, and are, on this account, more likely to be preferred. I have supposed that boats of 10 horse power would be used: they would, I think, be of a very eligible size: smaller ones would likewise be advantageous; especially in the beginning of this system of navigation.

Having obtained these preliminary data relative to open and slack water, I will proceed to apply them in the first place to

SLUICE NAVIGATION.

In the infancy of a country the first improvement in navigation which suggests itself is that of the natural bed of rivers, by clearing their channel and opening sluices through their shoals. So far as this goes to remove obstructions and to enable small boats, under the management of about 3 or 4 men, with a load of a few tons, to move down the stream and to return with a light load, it is attended with benefit; and, with all its imperfections, this navigation is even preferable to a road. But, beyond this degree, I think that it is an error, on a rapid river, to incur an additional expense for the enlargement of sluices; for, the strength of the current increasing with the size of the sluice, and moreover, the power necessary to move a larger boat increasing likewise with its dimensions, a proportional number of hands is requisite in the boat; and consequently, nothing is gained either in point of time or power. It generally happens, therefore, that when a river has much fall, the increased expense of its numerous sluices soon proves disproportionate to the result obtained; and that, after many fruitless attempts, this kind of navigation is abandoned and a more perfect improvement resorted to.

Sluice navigation has ever been objected to, not only on account of its uncertainty and danger, but also of the impracticability of applying to it a cheap and uniform power. But, what I conceive to be its greatest defect is, the waste of power, of whatever nature it may be, which it necessarily occasions.

In ascending a sluice, a boat must be propelled with a power capable of giving to it a velocity superior to that of the current; and consequently, though its progress is slow, the power exerted is exactly the same as that which would give to the boat in still water a velocity equal to that of the current in the sluice added to the actual speed with which the boat stems it. The propelling power, according to what has been said before, (page 452,) must then be proportional to the square of this *virtual* or *relative* velocity of the boat; or else, if, as is usually the case, the power remains the same, the weight moved must be reduced in the same rapid ratio; and indeed to even a much lower rate, when the power of men is used, for it is well known that this power, like the strength of animals, decreases rapidly when the speed, whether *real* or *virtual*, is increased. In going up, therefore, on account of the sluices to be stemmed, only very light loads can be transported, and but little useful effect is produced. In going down the stream, on the contrary, rapid sluices add to the danger of navigation, without increasing the useful effect, since prudence forbids large loads, which, besides, would lessen the speed in the ponds of still water, for which the load must then be calculated.

These remarks apply likewise to steam navigation. A current running at the rate of 5 miles an hour, for instance, may be stemmed by a steam boat capable of a velocity of 8 miles an hour; but then, though the actual velocity of the boat is only three miles an hour, its load must be suited to its *virtual* velocity of 8 miles an hour: and consequently, the useful effect of a 10 horse power will be, according to the above table, 18 tons; which being moved only 3 miles an hour, will be the same as 54 tons moved one mile: and the expense for the distance in which this current has to be stemmed, will be to that through still water, as the useful effect 144 of the same steamboat, moving 8 miles an hour in slack water, is to 54; that is almost three times as great. On a river, therefore, which has a rapid fall, the multiplied delays resulting from the current in sluices, and the consequent diminution of useful effect would materially increase the expense of steam navigation in ascending; while, on the other hand, the frequent and dangerous rapidity of the current in descending, would so often forbid the operation of steam as to render it an almost useless agent.

But, on a sluggish river, which has but few rapids improved by sluices, though the current of the sluices would, for the above reasons, prevent the carrying of large loads, still this would in part be compensated by a degree of speed, which would be but little affected by the occasional check of a few sluices. On such a river also, the operation of steam would so seldom be interrupted in descending, that it would be found an efficient and economical agent.

The cost of the improvement of a river of this nature by sluices, would be inconsiderable when compared to that of a canal; and might, frequently too, be much cheaper and otherwise more expedient than a lock and dam navigation.

Of this kind is, I think, *the Kanawha river;* and it was chiefly in reference to it, that I have been induced to make the preceding remarks. I have heard the opinion expressed, that the improvement had rather injured than benefitted the navigation; and, even that steam-boats would not answer *on the Kanawha.*

From what I have said above, it will appear, that I do not think the making of large sluices an advantage, so long as men are employed as the propelling power; and especially with large, heavy and unmanageable boats, as those used on the Kanawha: in coming up the sluices, the crew of the boat has to give to it a virtual velocity, which, as remarked just above, lessens the useful effect in a rapid ratio; and, though there may be much still water, the load must, notwithstanding, be suited to the swiftness of the sluices; and but little can be transported: and here, besides, we have not, as with steam, the advan-ge of speed in the ponds, because the day's work of men is li-ed, and is rapidly shortened by an accelerated muscular action.

At high water, when the current is swift, these large boats must be very difficult, and I may say, impossible to push up; for then, a virtual velocity would be requisite which men cannot give.

In descending, on the contrary, the current impels the boat forward with a rapidity, which takes the controul of its motion from the men: and a false manœuvre, a change of direction of the current, produced by a casual circumstance, may prove fatal to the cargo.

I, therefore, am ready to admit that, if to be navigated by boats propelled by oars or poles, the Kanawha river would have been nearly as useful, by merely cleaning out the principal obstructions; but, with the use of light steam-boats obeying readily the rudder, the advantages obtained will, I think, be considerable.

Only one of the sluices was as swift as 4½ miles an hour when I measured their current (there being then a slight rise in the river.) How then can it be doubted, that steam-boats capable of a velocity of 10 miles an hour could stem them; and, if they could, why should they not answer as good a purpose on that river as they do on others? Steam-boats have ascended the Susquehanna, which is a more rapid river, at the rate of from 4 to 5 miles an hour, at different stages of its waters; and some benefits are expected from their use in navigating it. But the Kanawha offers by far greater advantages. It has little fall; the sluices are but few; the ponds of still water very long: hence a steam-boat might move up generally at the rate of 8 miles an hour, in the long ponds of still water of this river, and though occasionally its velocity would be reduced to 4 or 5 miles an hour at a sluice, it would be but for a short distance: and, therefore, if the cost of transportation would be (as calculated above, and also established by facts,) $1 05 per ton per 100 miles, for a velocity of 8 miles an hour, I question much whether the sluices would raise it to as much as $1 25.

All this, of course, applies to a low stage of the river. In times of floods, the steam-boats would have to encounter a continuous current: But, the time of these swells constitutes but a small proportion of the year; and, when they are somewhat considerable, the present ascending navigation is at an end; whereas, steam-boats might yet ascend at the rate of 3 or 4 miles an hour, and bring freight for perhaps $2 or $2 50 a ton, from Point-Pleasant to Charlestown.

In going down, the boats would move in the ponds of still water at the rate of 4 or 5 miles an hour, according to their load; in coming to sluices, they would check their steam and obey the current. The danger of being wrecked would easily be guarded against with a power both so active and perfectly under control, and which is capable of an almost instantaneous retrograde motion. The danger would likewise be much lessened by the circumstance that the leader and lighters might be made to draw but 20 or 24 inches of water, if not less. A steam-boat of 25 tons is now building at Philadelphia, which will have a draught of only 2½ feet.

In conclusion, I do not think that the improvement of the Kanawha navigation will be found by far as valuable, until steam-boats be introduced on it; and then, I am convinced, that coal and labour being cheap there, freight, after a short time, will be transported at very nearly the above average rate of one dollar per ton per hundred miles: at present it is only the descending navigation which is facilitated; but, in connexion with the great scheme of communication, we must look to the ascending trade on that river.

As regards the *James river*, its fall is much greater than that of the Great Kanawha. It is only in the lower part, and in short sections that a sluice improvement might be made of such proportions as would facilitate the passage of steam-boats. But, it may be doubted whether the same fall might not be overcome at less expense by dams, than by well regulated and large sluices. The sluice at *Red-house Shoal*, on the Kanawha, for example, which is intended to regulate a fall of not quite 4 feet, will certainly have cost much more than would on James river a dam to raise the water 4 feet, with a lock in it.

James river is, moreover, frequently studded with rocks, among which the path of boats is very devious and difficult: it would be impossible for a light steam-boat, animated with a velocity of 8 or 10 miles an hour, or for the same boat moving at a reduced speed, but with several lighters in tow, to pursue, without danger, these crooked channels. The necessity of straightening them and making them, as well as the sluices, of enlarged dimensions to suit steam-boats, would render this a very expensive improvement: and it may be questioned, besides, whether it would be expedient to make a navigation exclusively applicable to steam-boats.

Dams will in general furnish, at less expense, a proper depth of water over the obstructions of the natural bed; by their means a slack water navigation is obtained; the trade is made more constant and regular; the delays may be more correctly estimated, and are the same, whether in ascending or descending; and the time of arrivals may be anticipated with some degree of certainty.

An improvement by sluices, on the contrary, produces an inequality between the ascending and descending trade, which may frequently be a great inconvenience. The delays are uncertain, and, in a common rise of the river, when dams check the current, sluices on the contrary increase it: the loss of time or waste of power in ascending becomes considerable; and the descending navigation is attended with greater danger.

The delay experienced at each dam, to pass through its lock, is often represented as an objection to the lock and dam system of improvement; but the delay produced by sluices is still greater: in a sluice for instance, a quarter of a mile in length and 3 feet deep, having a fall of 4 feet, the current would be at the rate of about 4 miles an hour: a steam-boat, moving at the rate of 8 miles an hour, would consequently stem it with a velocity of 4 miles; and, therefore, it would lose in the sluice nearly 4 minutes: a lock of 4 feet lift would hardly stop a boat this length of time. But, if the load be supposed to be increased, and consequently the speed of the boat lessened, its progress in ascending the sluice will be more and more retarded, until the load being increased to such a degree that it would reduce the speed to 4 miles an hour, the boat would actually be unable to move up the sluice. Whereas, under the same circumstance, it would, not only proceed on through the lock of a dam, but the velocity of 4 miles an hour would continue to be the most advantageous, as will be shewn below.

Hence, sluice navigation would only suit light and swift ascending boats capable of but little useful effect; when, on the contrary, heavy loaded boats, *which might be altogether stopped by sluices,* would not only move with facility on a river improved by locks and dams, but actually prove *much more profitable* than lighter ones.

It appears, consequently, that the relative inferiority of sluice navigation, when compared to a lock and dam improvement, would be about the same after the introduction of steamboats as it was before; and, in fact, the same propelling power having been used heretofore in both cases, and the application of the new power proposed being likewise the same for both improvements, there does not appear any reason, why their relative merits should be changed by it; and consequently, experience would decide now as formerly in favour of locks and dams.

LOCK AND DAM NAVIGATION.

The principal objection to this mode of navigation has ever been the expensiveness and inefficiency of the only propelling power which was applied to it; that of men, instead of horses which were used on canals. The first subject of enquiry appears, therefore, to be, what influence the introduction of steam in lock and dam navigation, would have on the cost of transportation.

I have already presented calculations and results applicable to navigation by steam on slack water, with different velocities and loads. In order to extend these results to a lock and dam navigation, it is only necessary to enquire how much should be added for detention at the locks to the prices stated in page 455.

In the same view of the subject that I have taken all along, I will suppose each boat to be detained at a lock one minute per foot lift; a position which I suppose will be admitted to be quite safe; it might, perhaps, at first appear, that the necessity of raising steam after having passed a lock might add more to the delay; but the steam-boat passing first might raise her steam while the lighters are passing.

In the preceding pages I have given the load corresponding to each rate of velocity in slack water, and the number of lighters requisite to carry it (each lighter being supposed to contain from 25 to 30 tons.)

The following diagram, constructed according to these data, exhibits, besides the data, the time lost at the locks for each foot lift by the whole train.

Velocity in slack water in miles per hour.	*Load in tons as before.*	*Number of lighters.*	*Leader and lighters will be detained by each foot lift, at the rate of one minute per foot lift, per boat.*
2 - -	- 400 -	- 15 -	- - 16 minutes.
2½ - -	- 255 -	- 10 -	- - 11 "
3 - -	- 175 -	- 7 -	- - 8 "
3½ - -	- 127 -	- 5 -	- - 6 "
4 - -	- 95 -	- 3 -	- - 4 "
5 - -	- 58 -	- 2 -	- - 3 "
6 - -	- 38 -	- 1 -	- - 2 "
8 - -	- 18 -	- 0 -	- - 1 "

The cost of the steam-boat of 10 horse power, which is supposed to be used, being $ 1 per hour, and that of each lighter 8 cents; the expense occasioned by detention at the locks for any fall and rate of speed, may now be readily calculated, and in the same way also might the investigation be extended to steam-boats of different power.

Having established previously, that velocities less than 3½ or 4 miles an hour, would not be advantageous, I will confine myself to calculations for the rates of 4, 5, 6 and 8 miles an hour. The process of computation is sufficiently explained by the following table:

A TABLE,

Shewing the cost of transportation by steam-power of ONE TON *a distance of* ONE HUNDRED MILES *on a river improved by locks and dams.*

FOR DIFFERENT FALLS AND RATES OF VELOCITY.

1st—FOR A VELOCITY OF 4 MILES AN HOUR.

One steam-boat of 10 *horse power,* 3 *lighters, freight* 95 *tons, expense per hour* $1 24.

(Each foot fall per mile adds 6 2-3 hours to the transportation per hundred miles, and $ 8 27 to the whole expense, or 8.70 cents per ton.)

Lockage in feet per mile.	*Delay per mile in minutes.*	*Rate to which the speed is actually reduced by the passage of locks. In miles per hour.*	*Cost of transportation of one ton per* 100 *miles.*	*Do. with the addition of* 35 *cents per ton for delays, stoppages, &c.*
0	0	4	33 cents.	68 cents.
1	4	3.15	42 "	77 "
2	8	2.60	50 "	85 "
3	12	2.20	59 "	94 "
4	16	1.95	68 "	103 "
5	20	1.70	77 "	112 "
6	24	1.55	85 "	120 "
8	32	1.30	103 "	135 "
10	40	1.10	120 "	155 "

2d—FOR A VELOCITY OF 5 MILES AN HOUR.

One steam-boat, 2 *lighters, freight* 58 *tons, expense per hour* $1 16.

(Each foot fall per mile adds 5 hours to the whole time, $ 5 80 to the expense, or 10 cents per ton)

0	0	5	40 cents.	75 cents.
1	3	4	50 "	85 "
2	6	3.33	60 "	95 "
3	9	2.85	70 "	105 "
4	12	2.50	80 "	115 "
5	15	2.20	90 "	125 "
6	18	2	100 "	135 "
8	24	1.66	120 "	155 "
10	30	1.45	140 "	175 "

3d—FOR A VELOCITY OF 6 MILES AN HOUR.

One steam boat, 1 *lighter, freight* 38 *tons, expense per hour* $1 08.

(Each foot fall per mile adds 3 1-3 hours to the time, $ 3 60 to the whole expense, or 9 1-2 cents per ton.)

Lockage in feet per mile.	*Delay per mile in minutes.*	*Rate to which the speed is actually reduced by the passage of locks. In miles per hour.*	*Cost of transportation of one ton per 100 miles.*	*Do. with the addition of 35 cents per ton for delays, stoppages, &c.*
0	0	6	47 cents.	82 cents.
1	2	5	57 “	92 “
2	4	4.30	66 “	101 “
3	6	3.75	76 “	111 “
4	8	3.33	85 “	120 “
5	10	3	95 “	130 “
6	12	2.75	104 “	139 “
8	16	2.30	123 “	158 “
10	20	2	142 “	177 “

4th—FOR A VELOCITY OF 8 MILES AN HOUR.

One steam-boat, no lighter, freight 18 *tons, expense per hour* $1.

(Each foot fall per mile adds 1 2-3 hours to the trip, $ 1 67 to the whole expense, or 9.60 cents per ton.

0	0	8	70 cents.	105 cents.
1	1	7	80 “	115 “
2	2	6.30	89 “	124 “
3	3	5.70	99 “	134 “
4	4	5.20	108 “	143 “
5	5	4.80	118 “	153 “
6	6	4.45	128 “	163 “
8	8	3.85	147 “	182 “
10	10	3.40	166 “	201 “

This table exhibits the following results:

1st. That *the additional expense occasioned by each foot lift per mile may be averaged at 9½ cents per ton per hundred miles.*

2dly. That if the train travel in slack water at the rate of 4 miles an hour, with a full load of 95 tons, its speed will be reduced to about the usual canal rate of from 2 to 2½ miles an hour by an average lockage of 3 feet per mile, and the cost of transportation will be 94 cents per ton per hundred miles, which is very little more than transportation on a canal in the case also of a full load.

3dly. That if the velocity in still water be 5 miles an hour, it will be reduced to canal speed by a fall of 4 feet, and transportation will be increased to 115 cents per ton.

4thly. That a velocity of 6 miles an hour will be reduced to the common canal rate by a fall of about 7 feet, and the expense will then be about 149 cents.

5thly. That the fall must be more than 10 feet per mile to reduce a velocity of 8 miles an hour to the usual rate of travelling on a canal.

These are the principal conclusions necessary for the present purpose. With the preceding table, calculations may be extended to any particular modification of load, speed or power.

CONCLUSION.

After having, pursuant to your order, considered every circumstance relative to the Independent Canal, I have laid down introductory principles, and obtained data necessary to the examination of the question relative to the best mode of improving the navigation of James river: The well and long established superiority of canal navigation over that of rivers, precluded the idea of investigating the question with a view to the common mode of propelling boats; but its features are altogether changed by the introduction of steam power.

From the 3d of the preceding remarks, it appears that 95 tons may be transported 100 miles for 94 cents per ton on a river having a lockage of 3 feet per mile, by a steam-boat of 10 horse power, moving at the rate of 4 miles an hour in still water; whose velocity would be reduced by the lockage, to the common rate of speed on canals. The expense of transportation in a boat with full load would be very nearly the me as on a canal.

If the steam-boat was made to move faster than 4 miles an ur, it would carry less; and consequently, the expense of ansportation would be greater: this would necessarily happen if the boat did not obtain a full load; but of course, it would also be the case with boats on a canal; or rather, it would be still more disadvantageous: for with a half load, for instance, a canal boat, though it would move faster than when fully loaded, could, nevertheless, not be propelled as fast as a steam-boat carrying an equal proportion of load: for it is well known that, on one hand, animals cannot usefully increase their speed beyond a certain degree; and that, on the other, a velocity exceeding 4 miles an hour is injurious to a canal. Hence if we were to compare cases when small loads will be carried, we should obtain a result greatly favourable to steam power.

If, for instance, a canal boat with a back load of one-fourth of its descending freight, that is 5 tons, would perform 100 miles in 4½ days (including a due proportion of its delay at both ends of the trip,) the cost of transportation of the 5 tons, would be in all - - - $13 50
Or per ton for 100 miles, - - 2 70

Supposing now, that a steam-boat has come down with a full load of 95 tons, and has to carry back its three lighters, (which is the most unfavourable case,) its back load being also one-fourth of its descending freight, would consist of 24 tons; which, together with the weight of the lighters, would make a whole load of about 38 tons. With this load, a steam-boat would advance 6 miles an hour in still water, according to the table; and its velocity would be reduced to 3¾ miles an hour on a river having a fall of 3 feet per mile. The expense of the steam-boat and three lighters would be $1 24 per hour or for 3¾ miles, (see the table.)
Which is per 100 miles for the 24 tons of freight actually transported, - - $33 10
Or per ton, - - - 1 38
To which adding as usual 35 cents per ton for delays, loading, &c. the cost of transportation of a ton 100 miles, will be - 1 73

Which is 97 cents cheaper than on the canal. So that this conclusion may safely be adopted, that: *on a river improved by locks and dams, and which has a fall of about* 3 *feet per mile, transportation by steam would be cheaper than on a canal:* this will again be adverted to.

We can now proceed to an application of all the foregoing results to the navigation between Lynchburg and Richmond.

It was with this view that I considered more particularly the case of a fall of 3 feet per mile, which is very nearly the average on James river, between Maiden's Adventure and Lynchburg.

The account of tolls would, therefore, be as follows:

17,112 tons at $ 5 50 per ton, are - -	$ 94;116
17,112 tons at an average of $ 2 75, - -	47,058
Total amount of tolls which would be paid by the existing trade,	$ 141,17[illegible]

Which is over 10 per cent. on the capital expended in the improvement.

The improvement of James river by locks and dams might, therefore, be safely undertaken. Tolls at the rate of $ 5 50 per ton from Lynchburg to Richmond (or three and two-third cents per mile) would still leave freight nearly $ 2 per ton cheaper than it is now. The revenue obtained would, even in the present state of the trade, pay a fair dividend on the cost; and the rapid increase of trade, which must be expected to result from this and other improvements, all converging towards James river, would go towards reducing the tolls and extinguishing the debt.

The improvement of James river by locks and dams from Richmond to Lynchburg is not, therefore, to be viewed as a future and problematical benefit; but as a present and certain source of revenue, within the immediate reach of the State.

Unwilling that the results I have here presented should be implicitly admitted, in a matter especially of so much public importance, I have given all the elements and details of my calculations: and I am confident that, upon careful examination, they will be found to rest on safe data.

In the 1st place, I have supposed that the interruptions of this navigation, by floods, repairs, or other causes, would be so considerable as to reduce it to only 300 days in the year; by this supposition the daily expense of the steam-boat has been increased, and every uncertainty or irregularity is compensated.

2dly. Enquiries relative to steam-boats, will shew that I have rather over-rated their daily expense in other respects.

3dly. I have supposed only one lock through each dam; but two locks might be made, and thereby detention be reduced to one-half of the time.

4thly. I have allowed, for delays, loading, &c. 35 cents per ton per 100 miles, which, as I have observed before, is too considerable when large loads are transported: for, when the trade shall once be well regulated, it is evident that large loads cannot produce a proportionate delay; for then, lighters may be loading at places of deposite before the arrival of the steam-boat, and be kept in readiness to be taken in tow. Admitting as above, (page 468) that an average of 119 tons are transported in a trip, to and from Lynchburg, the total allowance for delays, &c. at the rate of 35 cents per ton per 100 miles, would be for the whole distance and trip of 150 miles, $ 62 48 which, with a deduction of some fuel while the boat is making a load, may be fairly estimated to be equivalent to 6 full days of stoppage, &c. If this is deemed too great an allowance, it will follow, that *the cost of transportation is still susceptible of reduction.* Or else, that with the prices stated, the profits of the captain, who commonly will also be the owner of the steam-boat, will be very ample. If, for instance, we reduce to 3 days per trip the loss of time, the additional profit will be one-half of the above sum, or $ 31 24 for a trip of 11½ days (as will appear from the table,) or $ 2 72 per day.

It is probable that the rate of freight would fluctuate much at first; and would not settle itself to its lowest standard for a length of time: but this would also be the case with any other mode of improvement.

Between the Blue Ridge canal and Lynchburg the distance is 21 miles: the fall is about 104 feet: the cost of the improvement may be estimated at $ 1,600 per foot lift; or, for the whole distance and fall, - - $ 166,400

Above the Blue Ridge, the fall averages about 6½ feet per mile up to *Covington:* by recurring to the table, it will be seen that this fall would reduce a velocity of 4 miles an hour to 1½ miles an hour, and make the cost $ 1 20 per ton per 100 miles, or in all, (the whole freight being 95 tons,) $ 114 00. The back load being again supposed one-fourth of the descending one, or 24 tons, would, together with the 3 returning lighters, constitute a weight of 38 tons, with which (as shewn in the table,) the train would travel, on account of retardation by the locks, only 2¾ miles an hour. The cost of an hour being $ 1 24, it will be in all for 24 tons carried 100 miles, $ 45 10, or $ 1 88 per ton; to which 35 cents being added as usual, the cost of transportation per ton per 100 miles, will be $ 2 23; or, for the 24 tons, - $ 53 52

Total for the double trip, $ 167 52

The actual number of tons carried being 119, it would be per ton per 100 miles, - - $ 1 40

By a calculation applied to the section below Lynchburg, it has been seen that the average cost of transportation on the canal, would be per 100 miles, - - $ 1 20

So that above the Blue Ridge, transportation in the river would cost about 20 cents per 100 miles more than on a canal: but, on the other hand, while this difference is very small, the difference between the cost of a canal, and an improvement by dams and locks, would be much greater than below.

The canal above the Blue Ridge, has been estimated at nearly - - - $ 1,949,000
which would require an amount of - 155,920
to be raised by tolls, in order to produce 8 per cent. on the capital.

As to the lock and dam improvement of this section, the river diminishing in width and depth, as we proceed up, and good sites for dams being common in the upper section, and also materials of all sorts in great plenty, I am convinced, as I know the river well, that this improvement would be estimated high at $ 1,500 per foot lift:

The fall being 524 feet this would give for its probable expense, - - $ 786,000

In order to keep this kind of works in repair; to pay the yearly expense of attendance to the locks, which will be greater than on a canal; and in order also to afford a reasonable dividend on the expenditure, not less than 10 per cent. should be obtained on the capital; and, therefore, the tolls should produce - - - $ 79,000
which is only about one-half of what should be collected to pay a fair interest on the cost of the canal for the same distance.

Consequently, while the expense of transportation would nearly be the same in both cases, a canal would require more than double the trade of a lock and dam improvement. Whether or no the expense of this improvement, upon the complete scale here estimated, would be justified on the upper part of the river, is connected with the observations I have presented before, concerning the trade across the mountains, (page 440.)

In the foregoing estimates of the cost of transportation, I have supposed perfectly still water in the ponds above the dams. A current in these ponds would add as much to the time of ascending as it would retrench from that of descending; and, therefore, so long as it would not be attended with danger, it does not appear that it would have any sensible effect on the expense of transportation. In an ordinary swell of the river, dams would check the current in a certain proportion of their height: but, *in high floods their effect would not be felt*; and then the navigation would be interrupted.

Of the amount of what the interruptions by floods would be, I can form no very correct estimate; it is supposed that it would be but a few days in the year, perhaps not a week: I have allowed the very ample proportion of 65 days to the year for all interruptions.

The probable cost of the completion of the Independent Canal has been estimated at		$4,750,000
The expense of a lock and dam improvement on a substantial scale has been estimated below Lynchburg, at	$800,000	
From Lynchburg to the Blue Ridge,	166,400	
Above the Blue Ridge,	786,000	
		1,752,400
The probable difference between the expense of the two modes of improvement would consequently be nearly		3,000,000

By the introduction of steam-power, the côst of transportation would be about the same in both cases; and would, therefore, allow of the same tolls being collected. So far, therefore, as financial conclusions are concerned, there can be no doubt as to the most eligible improvement: but, several considerations of expediency remain still to be examined.

In the first place, the use of steam-boats requires that sufficient *freight* and *encouragement* should be given to them. The trade below Lynchburg is *now* sufficient to procure employment to 10 steam-boats of 10 horse power for 300 days in the year; so that there would be both *freight* and *competition.*

As to the probable encouragement, that would be extended to steam-boats; it must first be remarked, that transportation, by boats propelled by oars or poles in the deep ponds formed by the dams, could not, under the most favorable supposition, be less than $3 00 per ton for the distance of 120 miles between Lynchburg and Maiden's Adventure; whereas steam-boat transportation would be only $1 32, (page 469.) It is not doubtful, therefore, that, after a short time and a few trials, the price of freight by steam-boats being lowered below that of common boats, no one would be inclined to carry his own produce, or employ boats managed by men; but, that the farmer and the merchant would find it to their advantage to load lighters to be taken in tow by steam-boats.

The circumstance of a current produced by a swell of the river would equally accelerate a common boat and a stear boat; and, consequently, would not affect the relative expe of transportation in descending. But, not so on the retu steam-boats are capable of a velocity that could not be given by men, to even an empty boat; against the current, therefore, the assistance of steam-boats would be indispensable. Hence, under all circumstances, the great superiority of steam-power would soon secure general patronage.

The advantages of steam-boats, even when checked in their progress by dams, are demonstrated; the certainty of their being used and supported, is evident. It remains only to enquire whether there are not, against the nature of the improvement itself, some objections; or, in its execution some difficulty that might induce to forego all the pecuniary advantages of the mode of navigation under consideration.

This can only be determined by comparing the respective advantages and disadvantages of canals, and lock and dam improvement. On this subject there is a great diversity of opinions. This important question should, therefore, receive a full investigation, by which every doubt should be dispelled; every objection fairly met. For this purpose, I have presented here a comparative view of the two modes of improvement, in which I have endeavoured to include all the objections that I ever heard against them; in order that their relative merits may be conclusively tested.

COMPARATIVE ADVANTAGES AND DISADVANTAGES OF A CANAL AND A LOCK AND DAM IMPROVEMENT.

CANAL.	*LOCKS AND DAMS.*
1. The original cost of an Independent Canal is very great; it is proportional to the distance, and is much increased also by the fall; for, besides a greater expense of lockage, it generally happens that, where the fall is great, the ground is more difficult. The repairs of a canal require a considerable yearly expenditure.	1. The cost of a dam and lock improvement is regulated by the fall and width of a river; whence it follows, that it does not increase quite in proportion to the fall: and that this mode of improvement is particularly advantageous on small rivers, and in the very cases where a canal becomes most expensive and difficult. The ratio between the cost of a canal and a lock and dam improvement depends, therefore, on elements which operate differently: on James river, it would be nearly as *one* to *three*, (pages 472 and 473.) The expense of repairs is somewhat greater, in proportion to the original cost, than on a canal.
2. The expense of transportation on canals has ever been less, on account of the advantage of its tow-path, by means of which horses were enabled to draw boats, whereas on rivers only men with poles or oars were used.	2. In the bed of rivers horse power was proved, by long experience, to be almost inapplicable; men alone were employed: hence, canals were preferred. But *the introduction of steam power on rivers, would make the expense of*

CANAL.	*LOCKS AND DAMS.*
	transportation nearly the same as on a canal, and even lower when the fall is not great.
3. The expense of passing streams under a canal is one of the most considerable items of expense; and, near a feeder, or where the fall of the river is not rapid, it is very difficult, and sometimes impossible, to make culverts of such a capacity as to prevent an injurious accumulation of water above them.	
Along the James river, however, this difficulty has been greater on the section below Maiden's Adventure, than it will be above, where the feeders taken from the river will be but few, and at favourable places, where the fall being great, the canal would soon gain elevation enough to pass the nearest streams below: it can, in general, be located high enough to pass over tributary streams.	
4. The yearly expense of lock-keepers and agents is considerable.	4. A lock and dam improvement will require more lock-keepers. For this reason, and on account of a little greater liability to injury, the yearly revenue to be produced by the work has been estimated at 10 per cent. on the expenditure.
5. The expense of making fences has been found a heavy item, and their renewal would	

CANAL.	*LOCKS AND DAMS.*
prove a considerable object; but it is expected that floating gates, such as recommended in the beginning of this report, and which are now in construction, will be found to answer the purpose of dividing farms more effectually and at little expense.	
6. Farm and road-bridges are expensive and much in the way, especially on those parts which are liable to a swell. When the canal is not deep they might be dispensed with, by making paved fords across it, which would probably be preferred by farmers. Fords will hardly require any repairs if well made in the first instance.	
7. Transportation on a canal is certain, safe and regular, whether in ascending or descending. During the winter, however, they are subject to interruptions from frost, which will frequently close a canal while rivers still continue navigable.	7. The interruptions from currents to which a lock and dam navigation is subject, have always been an objection to it; this, with boats propelled by oars or poles in deep ponds of water, is a very serious difficulty. But if navigated by steam, the ponds formed by dams would seldom and but for a short time have a current that could not be stemmed by a steam-boat: and, besides, the deduction of 65 days in the year allows amply for this and other contingencies. Still there must inevitably be a difference, in times of swells, between the freight carried up and that taken down. This circumstance, on many rivers, might be a

CANAL.	*LOCKS AND DAMS.*
	great inconvenience; it would be particularly the case on the western waters, such as the Kanawha, Monongahela, Alleghany, &c. on which the ascending trade would be the most considerable, if communications were established across the mountains. But, on James river, the descending trade will ever be the most bulky; and, therefore, an ordinary current in the river will be an advantage to the trade, as it will assist where power is most needed. There will be a degree of uncertainty in this navigation; but not so much, I think, as might at first be supposed; for, the current will generally help as much in descending, as it will retard in ascending. So that the whole time of performing the trip will, probably, seldom vary. As to safety, it will much depend upon, and may be insured by, the construction of the dams and the site of locks; and it does not appear that there will ever be much danger for steam-boats, which can move backwards or forwards with equal facility, and master the element they move in.
8. Canals are also subject to frequent repairs, both of their works of art, as locks, dams and aqueducts, and also of their banks: permanency is secured only by great expense.	8 Dams are objected to as precarious and perishable; such, certainly, are dams built by private individuals; but the more perfect construction of those that would be erected for so

CANAL.	*LOCKS AND DAMS.*
	important a purpose, would insure firmness and durability. If built of wood in a substantial manner, they would probably only give way from decay, and above the low water line; and, with a careful attention on the part of agents, they might always be repaired in time and by small sections, so as to occasion no inconvenience to the trade. It would be preferable, however, to make them at once permanent and indestructible. The great injury that would be done to an active trade by the destruction of a dam, is not so much an objection against the improvement, as a strong recommendation to make it in a substantial and durable manner.
9. Canals are not altogether exempt from injuries by floods: they have dams, aqueducts and embankments, more or less exposed to the power of the current. The submersion of a canal in very high freshets is also a serious difficulty.	9. Dams are exposed to injuries from freshets, ice, and drifted timber: but, if made low, they would be out of danger in such floods as will bring down timber: as to ice, it is not very dangerous on James river.
Much expense of paving or walling, within and without, is required to secure it against abrasion round promontories, which place it within the bed of the river, above the highest floods of which, it would be almost impossible to raise it: but, when a canal passes through or near the low grounds, away from the river, freshets, though they may interrupt for a while	

its navigation, cannot do much injury to it.

10. A canal destroys part of the property it passes through; this causes heavy damages to be paid: the rest of the property is divided, to the inconvenience of the farmers; the canal compensates them however, at least in part, by the advantage of an easy navigation, which it brings to their very door.

The dams raised for the purpose of obtaining feeders from a river, are generally more injurious to the adjacent land than those raised merely for the purpose of facilitating navigation; in as much as the former are not only raised to a greater height, but also erected at the head of falls, in order to give elevation to the canal; whereas, the latter need not be any higher than merely to overcome falls.

10. It is generally objected, that dams would render marginal property more liable to inundations: this objection is, perhaps, more specious than real; it is at least much exaggerated. *High dams* near *low lands* would certainly have the effect of overflowing them in common rises of the river, which did not reach them before. But, in general, the evil will be confined to low bottoms, especially if the dams be made low.

To suppose that, because dams are an obstruction to the current, they would act as though the bottom of the river was raised to their top, is a very common error. They cause the water to flow more swiftly over them and thereby compensate for the want of water-way. A common swell of the river will certainly rise higher than it would without the dam; though not so much above this, as it would rise above the river itself, if no dam existed. But a great freshet, unless the dam be extraordinarily high, will not sensibly increase the elevation of the flood. Excellent remarks on this subject will be found in a report of my predecessor, Thomas Moore, (V. Supplemental Report of the Board of Public Works, page

11. Canal navigation is frequently obstructed by sediment brought down from lateral valleys intercepted by the canal, and from the steep slopes of its banks. These, besides, when composed of loose soil, as would mostly be the case on James river, are worn down at the surface of the water, and the width of the canal is encroached upon at the expense of the bank. All this may be guarded against; but by means which would vastly swell the expense.

The inevitable introduction of muddy water into a canal is also a considerable inconvenience.

13, 1819.) I do not think, therefore, that dams, raised no higher than to answer the purposes of navigation, would increase in any sensible degree, if at all, the injury done by freshets.

Near, and just over a dam, however, the current acquires an accelerated velocity, and a greater energy, which will injure the banks close to and immediately below the abutments. This circumstance requires that some measure should be taken to protect them when liable to abrasion.

11. It might, perhaps, be feared that the ponds formed by dams would be obstructed by depositions of sand and gravel from tributary streams, and from the main stream itself. This I do not think would happen any more than it does in those natural deep ponds that are remarked on all rivers to precede bars by which they are held up. In a high flood, an ordinary dam does not raise the stream sensibly higher than the river originally rose: this is generally admitted. Hence the water-way remaining the same as before, the velocity of the current must again be the same; and, consequently, it will continue to drive forward the sand and gravel usually set in motion during the freshets. It is only on a river whose bot-

CANAL.	*LOCKS AND DAMS.*
	tom is changeable and subject to shiftings that this might happen: but it is not the case with James river, whose bottom is generally rocky. Close to the dam, however, an accumulation of sand and gravel will generally be formed; but it is very easy to prevent its interfering with the lock, either by a lateral culvert lower than the mitre cill, and passing through the dam; or better, by a large sluice on one side to be opened at will, or by the operation of the current itself in floods. By a particular construction of dams, which I will mention below, these depositions would be completely controlled.
12. Canals are by some persons thought to be in some degree injurious to the health of the neighbourhood; but, with an active trade which would produce a constant renewal of the water, it does not appear that much harm can be done by them in this way.	12. Apprehensions are often expressed that the ponds of dams would be injurious to health: on this subject, however, opinions are various. It is indeed contended by some, that they would have a contrary effect, because they would keep the river at a constant height: if the dams be not made too high, there will always be, on an abundant river like the James river, a living current in the ponds. Mill ponds, it is true, are apt to cause sickness; but, almost all of them become stagnant in the summer and sink very low.
13. A canal accommodates only one side of a river, unless	13. A river extends its benefits equally to both sides: it fa-

CANAL.	*LOCKS AND DAMS.*
it be made to cross it very often. The canal along James river, above the Blue Ridge, would pass from one side to the other a sufficient number of times to require but a short land-carriage to reach some convenient point of it. The longest stretch on one side is from Wood's island to Shepherd's island; it is accessible from the south side by means of the bridge at *Pattonsburg.* Below the Blue Ridge, bridges at *Bethel*, *Warminster*, *Scottsville*, *New Canton*, all of which are important places, and which have ferries, would, together with the feeders and the existing bridges at *Lynchburg* and *Cartersville*, so divide the distance as to require but a short land transportation to reach a place of deposite.	cilitates intercourse and affords more general accommodation without requiring any additional expense for this purpose. On the upper part of James river, dams would destroy some very important fords which must be re-placed by bridges or ferries.

From the foregoing comparison, it will appear that the application of steam will remove the principal objections to lock and dam navigation, which would now so completely counterbalance the advantages of canals, that the consideration of their respective cost must be regarded as conclusive, in favour of lock and dam navigation

The first step to be taken when the melioration of the navigation of James river is resumed, appears to be its immediate extension to Lynchburg: it was concluded from the remarks made, (p. 439,) that the trade would justify the making of the *canal* from Maiden's Adventure to Lynchburg,

Estimated at - - $2,123,000

It was, however, calculated, that with tolls at the rate $6 per ton from Lynchburg to Richmond, the present trade alone was not quite sufficient to pay a reasonable dividend on this capital, as well as on the expense of the canal below Maiden's Adventure; and that about one-third of the requisite revenue must depend on the probable increase of trade, that may reasonably be expected to result from some lateral improvements, either in progress or about to be undertaken, as well as from that of James river itself.

The enquiries and calculations relative to a *dam and lock improvement*, have shewn that the capital required would probably be less than - - - $800,000: and that *the present trade alone*, with tolls at the rate of $5 50 per ton, from Lynchburg to Richmond, would immediately produce an adequate revenue on the expenditure (including the cost of the canal below Maiden's Adventure.) Upon which it may be remarked that, in order to establish a fair comparison between the benefit of a canal and that of a lock and dam improvement, the probability must also be admitted in this case; that the new road from Staunton to Scottsville; the intended improvement of the Rivanna; and the beneficial impulse given to the trade in general, would add about one-third to the present trade. Then the tolls, instead of $5 50, would be sufficient at the rate of about $4 00 per ton for the whole distance, to produce a result as beneficial as would be obtained from the canal. And it may be added, in favour of the lock and dam improvement, that about one-half of the capital on which the rate of tolls must be regulated, is the cost of the canal below Maiden's Adventure, though the section improved is only one-fifth of the distance to Lynchburg.

The improvement of the river by locks and dams should be preceded by a special and minute survey, to ascertain the best site of each dam; its most eligible height; the most advantageous position of its lock; the effect it would have on the low grounds; the injury it might do to mills on tributary streams, &c. The thickness to be given to the dam is also a matter of much importance: it depends on the head of water raised against it and on the force of the current in floods, which must be ascertained beforehand: In one word, every circumstance should be carefully investigated. The location of this kind of works requires perhaps more reflection and exercise of judgment than that of a canal.

The dams should every where be made as low as possible, and merely high enough to answer the purpose of throwing a sufficient depth of water over the obstructions and of overcoming the falls.

Low dams and locks being much below the surface of the river in times of freshets, are very little liable to accidents from them; and *they will not add to the injury done by floods to marginal property.*

As regards expense, low dams are particularly advantageous; since *the cost of these works decreases in almost a duplicate ratio of their height* when the foundations do not present any extraordinary difficulties: for *they must be made narrower in proportion as they are made lower.* Their abutments and locks also may be made slighter than when their height is great. On rapid rivers, high locks are in much danger in times of floods, and subject to frequent repairs and interruptions; whereas, experience has proved, that low locks stand very well while submerged. Low dams, besides, may often be made in a small arm of the river, where a high dam would cause the destruction of the island.

Protection may be afforded to boats approaching a lock, either by raising the part of the dam next to the lock to a greater height than the rest; or by extending a pier upwards; or also, when practicable, by building the lock in the pond of the dam. As to cutting short canals round the abutments of a dam, they most frequently prove very expensive, if made in a permanent way. Wherever the foundation would allow it, the dams might be made quite permanent, by erecting piers of masonry like those of a bridge to a proper height, and about 15 or 16 feet apart, with grooves in them, into which horizontal beams might be sunk above each other, and easily be made to join tight, so as to stop the stream effectually. By varying the number of these beams the height of the pond might be modified at pleasure.

With this plan, there could never be any interruption to the navigation, either from the decay of the dams, or from accidents done to them, since any number of beams might be removed and re-placed in a very short time.

The masonry of the piers being substantially done, and of a proper shape, the only part that could ever give way would be the intermediate timbers; such a circumstance would be of little moment, and a few hours would suffice to repair the damage after the subsiding of the flood.

An accumulation of sand or gravel at any part, and particularly near the lock, might be easily removed by raising the timbers out of their grooves. In the same way also might any pond be lowered to any necessary level to facilitate any work that might be required.

Hydraulick lime is an indispensable material in the construction of such dams; and would make them expensive if it was imported; but, if it should be discovered in the State, their cost would exceed but little, that of the dams of timber which have been built for the canal.

ON RAIL-WAYS.

Having concluded my report on the navigation of James river, I will add a few words on this mode of improvement, which has of late excited much public attention, and is now very deservedly in great favour in England.

The accounts that have been given on this subject have been very contradictory. They appeared, for a long time, more in the shape of opinions dictated by private interest or partiality, than as results of sound principles and actual experience. Like every thing new, they have had enthusiastic admirers and warm opponents.

It is surprising, however, that such a diversity of opinions should have existed in regard to rail-ways, whose properties depend on the most elementary principles in the application of power. What is in fact a rail-way? A mere road made of materials by which the resistance of friction is considerably reduced, whereby a propelling power is capable of more useful effect.

Friction and inertia are, it is well known, the two great obstacles that engineers or mechanicians have to overcome in the application of power. If it was not for the constant resistance opposed by friction, bodies once set in motion on a plane would never stop. A common road counteracts the pulling of horses by the considerable friction of the wheels; *M'Adamized* roads enable horses to draw heavier loads because of their greater smoothness, and a road made of iron offering still less resistance, will of course admit of much heavier loads being transported by the same power.

The resistance opposed by friction varies according to the nature of the substances placed in contact; it is proportional to the weight moved, *and remains the same whatever may be the velocity given;* in this last peculiarity consists the advantage of rail-ways.

On a canal, on the contrary, *the resistance increases as the square of the velocity of the boat*, and consequently, as I have remarked in speaking of navigation, a rapid rate of velocity, besides the injury it does to the banks of the canal, will allow of but small weights being carried on it.

Whereas, on a rail-road, if a power be capable of overcoming the resistance opposed by friction, it will, without any additional exertion, not only keep the body in motion, but, since friction is independent of velocity, it will continue to accelerate the speed without any other limits than the extent of velocity of which the propelling power itself is capable.

Because, the power of horses decreases rapidly when their speed is increased, it follows, that on a rail-way as well as on a canal, their velocity cannot be considerable; and that the advantage of rail-ways, *that velocity does not increase resistance*, is counteracted by the diminution of the power of exertion of horses when their speed is increased.*

Still, owing to the circumstance that rail-ways cost less than canals *in England*, transportation is found to be nearly the same there by either mode of conveyance, even when horse power is employed.

But recently a new propelling power has been introduced, which, like friction remains the same, whatever may be the velocity: this is the locomotive engine. After having once set a train of waggons in motion, the engine will continue to act with constant and undiminished power, and will accelerate the speed of the whole train, until it has attained the maximum velocity that can be given to the wheels by the strokes of the piston. By increasing, therefore, the velocity of the rim of the wheels by any means whatever, the speed of transportation on rail-ways might be increased *without limits*, by a propelling steam engine. Prudence alone fixes a limit to the velocity: a great swiftness on a straight road might occa-

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* The following table is given in a recent and valuable work by Thomas Tredgold, to shew the length of time that horses are capable of different velocities.

Duration of labour in hours, -	1	2	3	4	5	6	7	8	10
Maximum velocity in miles per hour, the horse being unloaded,	14.7	10.4	8.5	7.3	6.6	6	5.5	5.2	4.6

In the same work another table shews their power of exertion when moving at different rates of velocity. The following is an extract from it:

Speed in miles per hour, - -	2	3	4	5
Moving force, - - - - -	166	125	83	41 2-3

The rapid decrease of the power of horses is evident from these tables, which are entitled to perfect confidence, and agree both with calculations and experience.

sion very serious accidents; but in curves it would be particularly dangerous. It seems admitted, that a rate of speed of more than 6 miles an hour would exceed the bounds set by prudence, though some of the sanguine advocates of rail-ways extend this limit to 9 miles an hour. I should think, however, that this ought to depend on local circumstances which may increase or lessen the danger.

The advantage of rail-ways over canals as to transportation, is, therefore, that with the locomotive engine, an increase of speed, neither lessens the moving power, nor requires a diminution of the weight transported: whereas, on a canal, great velocities are inadmissible.

At slow rates, however, the same power will transport more on a canal than on a rail-way. The ratio is variously stated by those who have given comparative accounts of these two sorts of improvement; and in fact it could hardly be otherwise, for it would be almost impossible that in two successive experiments the numerous elements on which the comparison depends could be the same.

The statement most advantageous to rail-ways, makes the useful effect on a canal double that on a rail-way, when the velocity is 2 miles an hour; and it makes it equal with a velocity of 3 miles; beyond which the superiority of rail-ways increases rapidly with the speed.

Other statements, which I should be inclined to think more correct, make the useful effect on canals about three times as great when the velocity is 2½ miles an hour,
Double when it is 3 miles "
Equal for a velocity of 4½ miles "
Beyond this degree of speed, while the useful effect decreases on canals, it increases rapidly on rail-ways. Hence it appears that this mode of conveyance is particularly calculated for a fixed trade in which celerity is an object, as may be the case between two commercial and manufacturing places; and, in this respect, it must be very advantageous in a great many situations in England.

Rail-ways have, besides, the advantage that they are not liable to interruptions from floods or droughts, and but little from frosts; they can be made to extend their ramifications to any desired important point: and, in this respect, they suit particularly for the transportation of such objects as are constantly supplied from a fixed centre, because in this case they avoid the change of conveyance. The transportation of coal, for instance, by their means may be made from the coal-mine to the point of destination; whereas, if carried by water, it generally happens that it has to be transferred from waggons into boats, and sometimes again from boats into waggons. But a trade which is not concentrated, and has to seek the main artery of conveyance, is not so much benefitted by a rail-way.

But what contributes principally to the superiority of rail-ways over canals *in England*, is that they are found in most instances to be cheaper. From an average of the expense of a number of these works taken in England, it is estimated that
the medium cost of rail-ways is - - £ 5,000
and that of canals - - - - £ 9,000

From their acknowledged superiority in a great many instances in England, rail-ways have obtained warm advocates in this country; though the opinion seems most generally to prevail that they are not applicable here. Without attempting to judge of what is expedient in other States, I am of opinion that, at least in Virginia, rail-ways could not be extensively introduced.

A rail-road has been spoken of as a substitute for the navigation of James river; and, it is with a view of analysing this opinion, that I have introduced the foregoing observations on this mode of improvement.

In the first place, not only the expense of a rail-way here would not bear to that of a canal the same ratio it does in England, but it would actually cost more than a canal, as I will demonstrate.

In the making of a rail-way we have two things to consider: the *rails* and the *foundation*. The dimensions and strength of the rails are determined by the weight they have to support: hence the quantity of iron wanted is the same every where; but, from an estimate I have seen, cast rails in England cost $62 a ton delivered. Here, on the contrary, before delivery they would probably cost at least $112, and their price might be advanced by a greater demand: so much for the iron.

In regard to the foundation, it will be sufficient to enumerate its principal difficulties to give an idea of its considerable expense. For a double rail-way a road must be made about 30 feet wide; it must be graduated with mathematical precision, not inclining more than 1-8th of an inch to the running yard: it must not form abrupt curves; hence numerous deep cuts and expensive embankments: or, if these are not adequate to the object of avoiding great curvatures, expensive stationary engines and inclined planes must be constructed to carry the road in a direct line, over such elevations as could not be graduated at the maximum angle, which will allow the operation of the locomotive engine. Along cliffs, the rail-road must be kept above high-water, and held up by walls or paved banks, as expensive as along a canal.

It must be carried over *every creek* by *stone* or *iron* bridges, which would be a serious cause of expense along the valley of a large river which receives a great many tributaries of all sizes, none of which should be suffered to reach the rail-way; whereas a canal may receive many of the minor runs. It is of the utmost importance that a rail-road should be dry and firm: this requires side ditches to drain it, and trenches filled with broken stones under the foundations of the rails; for this reason also, the expense of deep-cuts would be increased by the difficulty of draining them, and that of embankments, by the necessity of placing in their body masses of broken stones to act as sinks, and prevent water from being retained by them.

If all these difficulties, and many others which it would be too minute to detail, are properly weighed, how could a rail-way cost less than a canal, in a valley so broken and intersected by streams and drains as that of James river? And how could it cost less than in England, when the expense for iron alone would be double?

The comparison which was made in England between rail-ways and canals, cannot apply to the James river canal:

1st. Because the canals of England are of much larger dimensions, than those which have been prescribed by law for the canal along James river.

2dly. Because stone and wood in England are dearer, and iron cheaper, than in this country.

3dly. Because the valley of James river presents great difficulties to the construction of a regular and uniformly graduated work.

Admitting the average cost of a rail-way in Enland to be correctly stated at 5,000*l*. or $22,000

(though some recent rail-ways are said to have cost much more) it is probable that here the expense of such a work would be greater than this sum.

If a rail-way, then, would be more expensive than a canal, it would be still more so than a lock and dam improvement. And as transportation with small velocities is admitted to be much cheaper on a canal than on a rail-way, there can be no doubt that, upon every consideration of expense, a rail-way along James river is not advisable.

As to its expediency in other respects, it will be sufficient to observe that rail-ways are advantageous only when great speed is a desirable object. But along James river, the trade is of a miscellaneous nature, the articles are bulky, more easily loaded in boats than in small waggons. The objects to be transported are scattered, and speed is not of so much consequence as economy of transportation. Though short interruptions of the navigation may be occasioned by floods, droughts on James river will never have this effect, and frosts hardly ever: so that the advantages of rail-ways, in this respect, are of no weight in this instance.

The making of a rail-way across the mountains has been also mentioned; but it would there be attended with still greater practical difficulties.

In the first place, the mountains are so rugged and broken, that the only practicable way to carry this plan into execution, would be to follow the valley of some creek which leads up to the top of the dividing ridge. But here, all the difficulties presented in the valley of James river, would be greatly multiplied. The graduation of the road must be almost every where among cliffs; its windings would be more numerous and considerable; the deep cuts would be enormously expensive; and the stationary engines and inclined planes very frequent, &c.: after having, at an immense expense, established the foundation of the rail-way, blocks of stone must be obtained, shaped and transported into a complete wilderness, and put in their place. Then castings must be obtained from a foundery at the rate of at least $112 per ton, and transported an immense distance to this same wilderness, to form a rail-way perhaps 100 miles in length at the rate of nearly [illegible]00 tons of iron 100
per mile, exclusive of fixed steam engines or machinery.

In England, where facilities of all sorts are concentrated, where there exists an extensive practical knowledge of these things, the nice adjustment of rail-ways may not be thought an object capable of having a material influence on the expense; but, among the mountains of Virginia, far from founderies, rails would have to be procured of particular shapes to suit each of the numerous curves of the road, and counteract the centrifugal force of the waggons in the turns.

What the expense of rail-ways, made under circumstances so unfavourable, would be, I am not prepared to say; but certain it is that it would be immense; and that the present state of things would not justify it.

All which is respectfully submitted.

C. CROZET, *P. Engineer.*

Richmond, July 1st, 1826.

P. S. Since writing this report, a circumstance has taken place, which requires that I should correct a statement made in page 397, where it is said that *the river near the head of the Cushaw Falls is crossed in a natural pond with the assistance of a towing-bridge.* This was so stated, because I had located the canal in this way, and considered a dam, to raise the natural pond, not only unnecessary but objectionable.

The late Commissioner had proceeded in the construction of the canal upon this plan.

The present Commissioner has thought proper to raise a dam at the head of the Cushaw Falls.

ACTS AND RESOLUTIONS

OF THE

GENERAL ASSEMBLY,

RELATING TO THE

FUND FOR INTERNAL IMPROVEMENT.

Passed at the Sessions of 1824-5—1825-6.

AN ACT,

Changing the time of meeting of the Board of Public Works, and for other purposes.

[Passed February 17th, 1825.]

1. *Be it enacted by the General Assembly,* That hereafter the annual meeting of the Board of Public Works shall take place on the second Monday in January in every year, instead of the time now prescribed by law, and the said Board shall hold only one session in each year: *Provided, however,* That nothing herein contained, shall be so construed as to repeal so much of the eighth section of the act, to create a fund for Internal Improvement, as authorises extra meetings of the Board of Public Works.

2. *Be it further enacted,* That the President and Directors of said Board, shall hereafter make their annual report on or before the Wednesday after the third Monday in January.

3. *And be it further enacted,* That it shall be the duty of the Second Auditor to report to the General Assembly, on or before the fifteenth day of each session thereof, an exact state of the fund for Internal Improvement.

4. All acts and parts of acts, coming within the purview of this act, shall be and the same are hereby repealed.

5. This act shall be in force from the passing thereof.

AN ACT,

Authorising the Board of Public Works to recover money due the fund for Internal Improvement, in a summary way.

[Passed February 16th, 1825.]

1. *Be it enacted by the General Assembly,* That it shall be the duty of the Second Auditor, on behalf of the Commonwealth, to move for judgment in the General Court, against any corporate body or individual, for the balance now due, or which may hereafter become due from such corporate body or individual, to the President and Directors of the Board of Public Works; whereupon, reasonable notice of such motion having been given, the general court shall render judgment for the principal sum due, and unlawfully withheld, with interest and costs; it shall be the duty of the Second Auditor, without delay, to sue out execution on such judgment, and send the same to the proper officer to be levied. And in case any sheriff or other officer, shall levy any execution upon such judgment, and shall return the same satisfied, paid or discharged, or in any other words, form or manner, which shall entitle the debtor to a credit therefor, either wholly or in part, and shall fail to pay into the public treasury, the amount of such credit, within two months after the return day of such execution, then such sheriff or other officer so failing, shall be liable to a judgment, upon motion, in the said court, for the whole amount of the money so levied, or of the credit to which the debtor is so entitled, with damages thereon, at the rate of twenty per centum per annum, from the return day of the execution, till the money shall be paid: *Provided,* That such sheriff or other officer have reasonable notice of such motion.

2. This act shall be in force from the passing thereof.

AN ACT,

Making farther provision to carry into effect the act, entitled "an act, for clearing and improving the navigation of James river, and for uniting the eastern and western waters, by the James and Kanawha rivers, and for other purposes."

[Passed February 16th, 1825.]

1. *Be it enacted by the General Assembly*, That the President and Directors of the James River Company be, and they are hereby empowered, as soon as may be necessary for the purposes herein declared, to borrow, on the credit of the State, a sum of money not exceeding two hundred thousand dollars, and at a rate of interest not exceeding six per centum per annum. The monies so to be borrowed, shall be paid into the treasury upon the warrant of the Second Auditor; and upon the receipt in the treasury of the sums so borrowed, the treasurer shall issue a certificate of stock for the amount thereof, purporting that the Commonwealth of Virginia owes to the lender, his heirs, executors, administrators or assigns, the sum loaned, together with the interest, at the rate of interest agreed on; and, that the interest is payable semi-annually, at the treasury of the Commonwealth. Such certificate shall shew, on the face thereof, that the loan was made under the authority of this act. It shall be signed by the Treasurer, and counter-signed by the Second Auditor, and registered in a book to be kept by him for that purpose, and be then delivered to the lender or his agent. Every such certificate of stock shall be transferrable on the books of the Second Auditor; and the semi-annual interest thereon shall be paid on his warrant. The principal sum authorised to be borrowed by this act, is hereby declared to be irredeemable for twenty years, but shall afterwards be redeemed at the pleasure of the General Assembly.

2. *Be it further enacted*, That, for the payment of the interest and final redemption of the principal of the sums to be borrowed under authority of this act, the same pledges and appropriations are hereby made and given, as are contained in the second section of the act, entitled "an act, authorising a loan for the purposes of internal improvement," passed the eighth day of March, eighteen hundred and twenty-four.

3. *Be it further enacted*, That the money directed to be

borrowed by this act, and the unexpended balance of the loan authorised by the act of the eighth of March last, shall be appropriated towards completing the works commenced on the Kanawha river and road, and to the extending the same road in the manner prescribed by law, and to completing the James and Jackson's river canal, and the works thereon to Maiden's Adventure Falls, and to the completing the canal now constructing along the margin of James river, from the lower end of Irish Falls in the county of Bedford, to the mouth of the North river, in the county of Rockbridge.

4. *Be it further enacted,* That, if the Commissioner of the Kanawha Road and Navigation, can, without loss to this Commonwealth, and without paying any compensation to the contractor, beyond the value of the work which he may have executed, procure an abandonment of the contract now existing, for the improvement of so much of the Kanawha river as lies between the town of Charlestown and the Great Falls of the same river, he shall then have full power and authority, and he is hereby required to extend the turnpike road, now constructing under his superintendence, from the said Great Falls, to the lower end of the Salt Works, in the county of Kanawha, and shall pretermit any further improvement in the navigation of the river, above the town of Charlestown.

5. *Be it further enacted,* That the said road shall be laid out and located by the said Commissioner, upon the best ground, to be selected by him, between the two points in this act mentioned; the road aforesaid, to be completed according to the provisions of the "act to amend the act entitled, 'an act for clearing and improving the navigation of James river, and for uniting the eastern and western waters by the James and Kanawha rivers;" reducing, however, the width of the summer roads to eleven feet, and in difficult places, dispensing entirely with such summer roads: *Provided,* That the county court of Kanawha shall finish the bridge contemplated, across Campbell's creek in said county, and shall keep the same in good repair at the county charge.

6. *Be it further enacted,* That so soon as the said road shall be completed, it shall and may be lawful for the President and Directors of the James River Company, and they are hereby required, to erect a toll-gate, at such place on said river as to them may seem proper, with such reasonable tolls as will pay to the said company, at least six per centum per annum, upon the sum of money which may be expended in constructing said road.

7. *Be it further enacted*, That to enable the James River Company to open and complete the aforesaid road, and to keep the same constantly in good repair, which they are hereby required to do, they shall be entitled to avail themselves of all the provisions which have been made by law for the opening and constructing the great road from Dunlap's creek to the falls of the Great Kanawha, as well for the condemnation of lands as for other purposes.

8. *Be it further enacted*, That it shall be lawful, and the President and Directors of the James River Company, are hereby required, to pay over to the President and Directors of the Board of Public Works, the sum of ten thousand dollars, the premium on the loan of four hundred thousand dollars, authorised by the act of the General Assembly, passed the eighth day of March, eighteen hundred and twenty-four, to be by them passed to the credit of the permanent fund.

9. *Be it further enacted*, That, whensoever any certificate of the stock created by this act, or by any previous act, for the use of the James River Company, shall have been lost by the holder or holders thereof, it shall and may be lawful for the Second Auditor and Treasurer to renew the same in the manner provided in the first section of this act: *Provided, however*, That such certificate shall not be renewed until the party, applying for the same, shall produce satisfactory proof of his having advertised the same, at least three months previous to his application, shall execute a bond, with sufficient security, to the treasurer and his successors, conditioned to indemnify the Commonwealth against any loss in consequence of the issuing such certificate, and shall moreover file an affidavit, setting forth the time, place and circumstances of such loss.

10. *Be it further enacted*, That the fourth section of the act, entitled "an act, authorising a loan for the purposes of internal improvement," passed March the eighth, eighteen hundred and twenty-four, shall be, and the same is hereby repealed.

11. *Be it further enacted*, That it shall and may be lawful for the Commissioner of the Kanawha river and road, and he is hereby required, to appoint collectors, erect gates, and receive tolls upon the said road, at or near the following places: at Callaghan's on the sixth mile of said road; at the White Sulphur Spring, on the twenty-first mile; (*Provided*, That no toll shall be demanded of visitors at the Springs, when riding or passing out and in from the Springs for exercise;) at Green-

brier river; at Crist's on the twelfth mile west of Lewisburg; at Metzker's on the fifty-first mile, and at Gauley river on the sixty-third mile. At every gate, the following tolls shall be demanded and received, to wit: For every score of sheep or hogs, six cents; for every score of cattle, twenty cents; and so in proportion for any greater or lesser number; for every horse, mare, mule or gelding, five cents; for a man the same as a horse; for every four wheeled riding carriage, thirty cents; for every two wheeled riding carriage, fifteen cents; for every cart or waggon, twelve and a half cents for every four footed animal drawing the same: *Provided, always*, That return waggons or carts shall pay one-half the said tolls only; *And provided, also*, That no toll shall be demanded or received from persons residing within four miles of any gate, and who shall not have travelled a distance upon said road exceeding four miles.

12. *Be it further enacted*, That before any collector appointed by the authority of this act, shall proceed to the collection of any of the said tolls, he shall execute a bond with good and sufficient security, in the penalty of one thousand dollars, payable to the President and Directors of the James River Company, conditioned, that he will make due returns of all tolls, well and truly account for all monies which may come into his hands by virtue of his appointment; and regularly pay the same to the Commissioner of the Kanawha river and road at the end of every three months, commencing from the date of the said bond; which said bond shall be filed and recorded with the clerk of the court of the county in which the said collector shall reside; and if he shall fail to make such returns regularly, at the end of every three months or within twenty days thereafter, being required so to do by the said Commissioner, it shall and may be lawful for the said court, in which the said bond is filed, on motion of the said Commissioner, on behalf of the James River Company, to enter up a judgment against the said collector and his securities for a sum not exceeding fifty dollars and costs; and such motion and judgment may be repeated, until a compliance with the provisions of this act shall be enforced.

13. *Be it further enacted*, That, if from any return hereinbefore directed, it shall appear that there is any sum of money in the hands of such collector, and he shall fail to pay the same within twenty days after the period up to which such return has relation, it shall be lawful for the said court herein-before mentioned, on motion of the said commissioner, on behalf of

the James River Company, to render judgment for the amount so appearing to be due, with interest, at the rate of ten per centum per annum, from the time such return closed and costs: *Provided always*, That the said commissioner shall, before the making either of the said motions authorised by this act, give to the said parties, at least ten days notice of his intentions so to do: *And provided also*, That nothing in this act contained, shall be so construed, as to repeal the nineteenth and twentieth sections of the act, entitled "an act, making more effectual provision to carry into effect, the act entitled 'an act, to amend the act, entitled 'an act, for clearing and improving the navigation of James river and for uniting the eastern and western waters by the James and Kanawha rivers, and for other purposes."

14. *Be it further enacted*, That each collector, before entering on the discharge of the duties hereby required, shall appear in the court of the county where the toll-gate is erected, and make oath or affirmation, that he will well and truly make return, account for and pay over to the said commissioner of the Kanawha river and road, all sums of money by him received under the authority of this act; and if any collector shall undertake to discharge the duties of said office, without first taking such oath, he or they so neglecting to take such oath, shall forfeit and pay the sum of twenty-five dollars, to be recovered by motion, on ten days notice, in the court of the county where the toll-gate is established.

15. *Be it further enacted*, That, if from any cause, it shall appear to the commissioner of the Kanawha river and road, that the interest of the James River Company will require it, he shall have full power and authority to dismiss any collector, or to require from any such collector, when he may deem it necessary, a new bond and security with like conditions as are required by this act.

16. *Be it further enacted*, That the collectors of the tolls on said road, shall receive six per cent. commission on all sums received by them at the different toll gates, and the same power and authority is hereby given them to enforce the payment of the tolls aforesaid, which is vested in the commissioner of said road.

17. *Be it further enacted*, That so much of the thirteenth section of the act, entitled "an act, making more effectual provision to carry into effect the act, entitled 'an act, to amend the act entitled 'an act for clearing and improving the navigation of James river, and for uniting the eastern and western

waters by the James and Kanawha rivers, and for other purposes," as authorises the commissioner for the James and Jackson's rivers, to appoint an engineer, shall be and the same is hereby repealed.

18. *Be it further enacted*, That so much of the thirteenth section of the act, entitled "an act, making more effectual provision to carry into effect the act, entitled 'an act, to amend the act, entitled 'an act, for clearing and improving the navigation of James river, and for uniting the eastern and western waters by the James and Kanawha rivers, and for other purposes," as authorises the commissioner of the James and Jackson's river canal to appoint engineers, shall be and the same is hereby repealed; and the commissioner of the James and Jackson's river canal, who shall hereafter be appointed, shall perform all the duties now required of him by law, and shall also perform all the duties of an engineer, which may be necessary in the prosecution of the works under his direction; for which he shall receive eighteen hundred dollars, in lieu of the compensation heretofore allowed by law.

19. *And be it further enacted*, That so soon as the lower section of the canal shall be completed from the basin in the city of Richmond, to Pleasants' Island, the James River Company shall be, and they are hereby entitled to demand and receive the following tolls upon the said section, in lieu of the tolls heretofore allowed them by law, to wit: Flour per barrel, ten cents and four mills; wheat per bushel, one cent and six mills; corn, rye, barley, buck wheat, and flax and hemp seed, per bushel, one cent two mills; peas and beans per bushel, one cent five mills; oats per bushel, six mills; meal, of all sorts of grain, (including ship-stuff) per bushel, one cent two mills; bran per bushel, two mills; clover seed per bushel, ten cents; all other grass seed per bushel, three cents; hemp per ton, one dollar and fifty cents; flax and cotton per hundred pounds, ten cents; tobacco per hogshead, one dollar; tobacco manufactured, per hundred pounds, ten cents; butter and bees' wax, twenty cents per hundred pounds; lard, tallow and cheese, per hundred pounds, twenty cents; soap per hundred pounds, sixteen cents; candles per hundred pounds, twenty-five cents; pork and beef per barrel, twenty-five cents; pork and beef unsalted, per hundred pounds, eight cents; bacon per hundred pounds, fifteen cents; fish per barrel, ten cents; linseed and train oil per gallon, eight mills; cider, beer and vinegar, per barrel, ten cents; apples, potatoes and other domestic fruits and roots, per bushel, five mills; wool and feathers per hundred pounds,

thirty-five cents; hay, fodder and sheaf oats, per hundred pounds, two cents; straw, shucks and other forage, per hundred pounds, one cent; dry hides per hundred pounds, twenty cents; green hides per hundred pounds, ten cents; leather, upper, per hundred pounds, twenty-five cents; leather, sole, per hundred pounds, twenty cents; coal, per bushel of five fourths, as soon as the canal is finished for its accommodation, (the present toll to be continued until then,) one cent five mills; bar iron and castings per ton, one dollar and fifty cents; hoop iron, nail rods and nails, per hundred pounds, ten cents; pig iron per ton, seventy-five cents; copper and zinc, per hundred pounds, twelve cents five mills; lead per hundred pounds, ten cents; shot per hundred pounds, twelve cents five mills; tin per hundred pounds, twenty-five cents; window glass per hundred feet, ten cents; gypsum per ton, twelve cents five mills; stone per ton, seventeen cents; grind stones and mill stones per hundred pounds, five cents; lime per bushel, five mills; marble, polished, per ton, two dollars; other dressed stone per ton, twenty-five cents; slate and tile per hundred square feet, fifteen cents; bricks per thousand, twenty-five cents; sand, clay and manure per ton, five cents; whiskey, apple and peach brandy, per gallon, five mills; rum and other spirits per gallon, one cent five mills; wine and cordials per gallon, two cents; molasses per gallon, five mills; brown sugar per hundred pounds, ten cents; coffee and loaf sugar per hundred pounds, twelve cents five mills; teas per pound, three mills; salt per sack, six cents; salt per bushel, one cent five mills; earthen and stone ware, and glass in crates, hogsheads, or otherwise packed, per hundred pounds, twelve cents five mills; mahogany and other furniture per hundred pounds, twelve cents five mills; mahogany per hundred solid feet, fifteen cents; dye woods per hundred pounds, five cents; large squared and round timber per hundred solid feet, if conveyed in boats, six cents five mills; large squared and round timber per hundred solid feet, if conveyed in rafts, thirteen cents; plank and scantling reduced to inch measure, and all plank, laths, and other sawed stuff, less than one inch thick, per thousand feet, if in boats, twenty-five cents; same, if in rafts, fifty cents; barrel staves and heading per thousand, fifteen cents; hogshead staves and heading per thousand, thirty cents; hoop poles per thousand, ten cents; shingles and rived boards per thousand, ten cents; rived laths for plaistering per thousand, one cent; empty barrels, each one cent; empty hogsheads, each four cents; fire wood per cord, eight cents; ashes, undripped, per ton, (dripped to pass as manure) eight cents; pot and pearl ash per hundred pounds, twelve cents five mills; tanners' bark per cord, ten cents; oysters and oyster shells, per bushel, five mills; articles not enumerated, and not in packages, per hundred pounds, five cents; articles packed in hogsheads or barrels per hundred pounds, ten cents; articles packed in trunks, boxes or bales per hundred pounds, fifteen cents; live stock per head, five cents; empty boats or less than eight tons burthen, or boats of that size with loading not bringing twenty-five cents toll, twenty-five cents; empty boats of more than eight tons burthen, or boats above eight tons, with loading not bringing seventy-five cents toll, seventy-five cents.

20. And it shall be lawful for the said Company, so soon as the mountain section of the said canal, from the mouth of the North River to the Irish Falls, shall be completed, to demand and receive the following tolls, to wit: Flour per barrel, three cents; wheat per bushel, five mills; corn, rye, barley, buckwheat, and flax and hemp seed per bushel, four mills; peas and beans per bushel, five mills; oats per bushel, two mills; meal of all sorts of grain, (including ship-stuff,) per bushel, four mills; bran per bushel, one mill; clover seed per bushel, three cents; all other grass seed per bushel, one cent; hemp per ton, thirty-seven and a half cents; flax and cotton per hundred pounds, two cents five mills; tobacco per hogshead, thirty cents; tobacco, manufactured, per hundred pounds, three cents; butter and bees' wax per hundred pounds, six cents; lard, tallow and cheese per hundred pounds, five cents; soap per hundred pounds, four cents; candles per hundred pounds, seven cents; pork and beef per barrel, five cents; pork and beef, unsalted, per hundred pounds, two cents; bacon per hundred pounds, four cents; fish per barrel, three cents; linseed and train oil per gallon, two mills; cider, beer and vinegar per barrel, two cents five mills; apples, potatoes and other domestic fruits and roots per bushel, two mills; wool and feathers per hundred pounds, six cents; hay, fodder and sheaf oats per hundred pounds, two mills; straw, shucks and other forage per hundred pounds, one mill; dry hides per hundred pounds, five cents; green hides per hundred pounds, two cents five mills; leather, upper, per hundred pounds, six cents; leather, sole, per hundred pounds, five cents; coal per bushel, four mills; bar iron and castings per ton, twenty-five cents; hoop iron, nail rods and nails per hundred pounds, two cents five mills; pig iron per ton, twenty cents; copper and zinc per hundred pounds, three cents; lead per hundred pounds, two cents five

mills; shot per hundred pounds, three cents; tin per hundred pounds, six cents; window glass per hundred feet, two cents five mills; gypsum per ton, three cents; stone per ton, four cents; grind-stones and mill-stones per hundred pounds, one cent; lime per bushel, one mill; marble, polished, per ton, fifty cents; other dressed stone per ton, six cents; slate and tile per hundred square feet, four cents; bricks per thousand, six cents; sand, clay and manure per ton, one cent two mills; whiskey, apple and peach brandy and molasses per gallon, one mill; rum and other spirits per gallon, five mills; wine and cordials per gallon, five mills; brown sugar per hundred pounds, three cents; coffee, loaf sugar, and mahogany and other furniture, per hundred pounds, three cents; teas per pound, one mill; salt per sack, two cents; salt per bushel, three mills; earthen and stone ware and glass in crates, hogsheads, or otherwise packed, per hundred pounds, three cents; dye woods per hundred pounds, one cent two mills; mahogany per hundred solid feet, four cents; large squared and round timber per hundred solid feet, if conveyed in boats, one cent seven mills; same, if conveyed in rafts, three cents four mills; plank and scatling reduced to inch measure, and all plank, laths, and other sawed stuff less than one inch thick, per thousand feet, if conveyed in boats, six cents; if conveyed in rafts, twelve cents; barrel staves and heading per thousand, four cents, hogshead staves and heading per thousand, seven cents five mills; hoop poles, shingles and rived boards per thousand, two cents five mills; rived laths for plaistering per thousand, two mills; fire wood per cord, two cents; empty barrels, each, two mills; empty hogsheads, each, one cent; ashes undripped, per ton, (dripped to pass as manure,) two cents; pot and pearl ash per hundred pounds, three cents; tanners' bark per cord, two cents five mills; live stock per head, one cent two mills; articles not enumerated and not in package, per hundred pounds, one cent two mills; articles not enumerated, packed in hogsheads or barrels, per hundred pounds, two cents five mills; in trunks, boxes or bales, per hundred pounds, four cents; empty boats of less than eight tons burthen, or boats of that size with loading bringing less than twenty-five cents toll, six cents; empty boats of more than eight tons burthen, or boats above eight tons, with loading not bringing seventy-five cents toll, twenty-five cents.

21. All acts and parts of acts coming within the purview of this act, shall be and the same are hereby repealed.

22. This act shall be in force from the passing thereof.

AN ACT,

To amend the act, entitled "an Act, making farther provision to carry into effect an Act, entitled 'an Act, for clearing and improving the navigation of James river, and for uniting the eastern and western waters by the James and Kanawha rivers, and for other purposes."

[Passed February 18th, 1825.]

1. *Be it enacted by the General Assembly of Virginia,* That so much of the act, entitled "an act, making farther provision to carry into effect an act, entitled 'an act, for clearing and improving the navigation of James river, and for uniting the eastern and western waters by the James and Kanawha rivers, and for other purposes," passed during the present session of the General Assembly, as directs the sum of ten thousand dollars, the premium on the loan of four hundred thousand dollars obtained by the James river company, to be passed to the credit of the permanent fund of the Board of Public Works, be and the same is hereby repealed; and that the President and Directors of the Board of Public Works, be and they are hereby directed to pass the aforesaid sum to the credit of the disposable fund for internal improvement.

2. This act shall commence and be in force from the passing thereof.

AN ACT,

To authorise the stockholders of the Dismal Swamp Canal Company to increase their capital stock.

[Passed February 10th, 1825.]

Whereas it is represented to this General Assembly, that the funds provided to complete the Dismal Swamp Canal, are inadequate to the object; and it is recommended by the Board of Public Works, to authorise the said company to increase their capital stock, for the purpose of obtaining the means necessary to perfect this important improvement:

1. *Be it therefore enacted,* That it shall be lawful for the President and Directors of the Dismal Swamp Canal Company,

to open books for the subscription of as many additional shares, as will increase the capital of the said company, to an amount which may be sufficient to complete the canal.

2. *Be it further enacted*, That the stockholders of the said company for the time being, shall have a preference in the subscription of the new stock, by this act authorised to be created, for the first thirty days after the books are opened, but no longer. And all proprietors of such additional shares, shall, and are hereby declared to be from henceforth incorporated into the said company, upon the same terms, and with the like privileges of the original stockholders.

3. *Be it further enacted*, That this act shall have no force or effect, until it shall have been sanctioned and approved by the stockholders in a general meeting convened agreeably to the provisions of the charter of said company, and they shall have decided upon the increase of capital necessary to carry the object of this act into effect.

4. This act shall be in force from the passing thereof.

AN ACT,

Authorising the Board of Public Works to subscribe for a part of the stock of the Ashby's Gap Turnpike Company.

[Passed February 7th, 1825.]

1. *Be it enacted by the General Assembly*, That it shall be lawful for the President and Directors of the Board of Public Works, to subscribe, on behalf of the Commonwealth, one hundred and forty shares to the stock of the Ashby's Gap Turnpike Company, payable one-half on the first day of February, eighteen hundred and twenty-seven, and the other moiety on the first day of February, eighteen hundred and twenty-eight: *Provided*, That the Board of Public Works shall have the appointment of two Directors, to represent the State's interest in said company.

2. This act shall be in force from the passing thereof.

AN ACT,

To amend the act, entitled "an act, authorising the President and Directors of the Snicker's Gap Turnpike Company, to alter their road; and for other purposes."

[Passed January 12th, 1825.]

1. *Be it enacted by the General Assembly*, That the court of the county of Loudoun, are hereby authorised and empowered, upon application of the President and Directors of the Snicker's Gap Turnpike Company, to appoint three Commissioners, not being stockholders, nor residing on or near said road, whose duty it shall be to view such part or parts of said road, where a reduction of the width of the summer or side roads is desired by the company, and report their opinion, as to the difficulty, and expense of forming summer roads of eight feet in width, and also that of summer roads or shoulders of four feet in width; whereupon, if the said county court should think the expense and difficulty of making the summer road eight feet in width, greater than is demanded by public convenience, they are hereby authorised, (a majority of the acting magistrates being present or having been summoned for that purpose,) to make an order giving to the said company the privilege of reducing the said side roads of eight feet, to shoulders or side roads of four feet in width, in such parts of the Snicker's Gap Turnpike Road, as may be designated in the said order, which shall be recorded, and thereafter govern the said President and Directors in the construction of said shoulders or side roads.

2. All acts and parts of acts, coming within the purview of this act, shall be and the same are hereby repealed.

3. This act shall be in force from the passing thereof.

AN ACT,

To amend an act, entitled "an act, to revive and amend an act, entitled 'an act, incorporating a company to establish a turnpike road from the town of Staunton to James river."

[Passed February 12th, 1825.]

1. *Be it enacted by the General Assembly,* That so much of the act, passed on the eighth day of March, eighteen hundred and twenty-four, entitled, "an act, to revive and amend an act, entitled 'an act, incorporating a company to establish a turnpike road from the town of Staunton to James river," as authorises subscriptions to the amount of two hundred thousand dollars, shall be and the same is hereby repealed.

2. *Be it further enacted,* That the Commissioners named in the before recited act, shall be authorised to open books for receiving subscriptions to the amount of fifty thousand dollars, for the purpose therein mentioned.

3. *Be it further enacted,* That the said road shall be constructed upon the plan adopted in the construction of the State road, from Covington to the falls of the Kanawha river, thirty feet in width, duly graduated according to the provisions of the general turnpike law, but need not be paved except where in the opinion of the Commissioners appointed by the company, it shall be deemed essentially necessary.

4. *And be it further enacted,* That the said company shall be allowed for the first twelve months after the completion of the said road, one-half of the tolls authorised by the act entitled "an act, prescribing certain general regulations for the incorporation of turnpike companies," and the tolls shall then be so graduated as to yield the profit on the capital stock expended, authorised by said act.

5. When three-fifths of the capital stock of the said company shall have been subscribed by others, and one-fifth actually paid, or the payment thereof assured to the satisfactioon of the Board of Public Works, the said Board shall be, and they are hereby authorised, if they deem it expedient, to subscribe for the other two-fifths or any part thereof, upon the terms and conditions prescribed by the act passed the fifth of February, eighteen hundred and sixteen, entitled "an act, to create a fund for Internal Improvement."

6. All acts and parts of acts, coming within the purview of this act, shall be and the same are hereby repealed.

7. This act shall commence and be in force from the passing thereof.

AN ACT,

Authorising a loan for the purposes of Internal Improvement.

[Passed March 1st, 1826.]

1. *Be it enacted by the General Assembly*, That the President and Directors of the James River Company be, and they are hereby empowered, as soon as may be necessary, for the purposes herein declared, to borrow on credit of the State, a sum of money not exceeding two hundred thousand dollars, and at a rate of interest not exceeding six per centum per annum. The sum so to be borrowed, shall be paid into the treasury, upon the warrant of the Second Auditor; and upon the receipt into the treasury of the sum so borrowed, the Treasurer shall issue his certificate of stock for the amount thereof, purporting that the Commonwealth of Virginia owes to the lender, his heirs, executors, administrators or assigns, the sum loaned, together with the interest, at the rate of interest agreed on; and that the interest is payable semi-annually at the treasury of the Commonwealth. Such certificate shall shew on the face thereof, that the loan was made under the authority of this act. It shall be signed by the Treasurer and counter-signed by the Second Auditor, and registered in a book to be kept by him for that purpose, and be then delivered to the lender or his agent. Every such certificate of stock shall be transferable on the books of the Second Auditor, and the semi-annual interest thereon, shall be paid on his warrant. The principal sum authorised to be borrowed by this act, is hereby declared to be irredeemable for twenty years, but shall afterwards be redeemed at the pleasure of the General Assembly.

2. *Be it further enacted*, That for the payment of the interest, and the final redemption of the principal of the sums to be borrowed under the authority of this act, the surplus tolls, rents and water rights on the mountain section of the James river canal, and the works on the Kanawha river and road, are hereby pledged, and if these appropriations should be inadequate to the payment of interest, and the final redemption of the principal of the sum now proposed to be borrowed, and that already expended on the said works, the General Assembly pledges itself to find other and sufficient funds, and until such other and sufficient funds be furnished, the revenues of the fund for Internal Improvement, are hereby pledged and appropriated.

3. *And be it further enacted*, That the President and Directors of the Literary Fund, shall invest the uninvested capital belonging to that fund, in the stock authorised by this act. And that each certificate of stock issued in pursuance of this act, shall have on its face a direct reference to the act which authorised it.

4. *Be it enacted*, That the Commissioner of the Kanawha road and navigation, shall forthwith settle all the contracts for work on the mountain section of the James river canal, as far as the contractors have completed any jobs heretofore. He shall not contract for a farther extension of the Kanawha road, but is authorised to complete the improvements on the Kanawha river, up to the present termination of the turnpike road. The Commisioner or Commissioners, whose duty or duties it may be to carry into effect the third section of this act, shall not do any act or make any contract which may subject the State to the payment of a sum of money exceeding in amount, the sum herein directed to be borrowed.

5. *And be it further enacted*, That the following tolls shall be collected and paid on the Kanawha turnpike road, instead of the tolls now prescribed by law, in conformity with, and subject to the several regulations contained in the twelfth, thirteenth, fourteenth, fifteenth and sixteenth sections of the act, passed on the sixteenth day of February, one thousand eight hundred and twenty-five, entitled "an act, making further provision to carry into effect the act, entitled 'an act, for clearing and improving the navigation of James river, and for uniting the eastern and western waters by the James and Kanawha rivers, and for other purposes," except that the Commissioner shall be authorised to pay to the toll-gatherers, a sum not exceeding nine per centum, to wit:

At every gate except at Gauley bridge.

For every score of hogs or sheep, six cents.
For every score of cattle, twenty cents; and so in proportion for a greater or less number.
For every horse, mare, mule or gelding, six and a quarter cents.
For every person on horseback, twelve and a half cents.
For every four wheeled riding carriage drawn by four horses, thirty-seven and a half cents.
For every four wheeled riding carriage drawn by two horses, thirty-one and a quarter cents.

For every two wheeled riding carriage, eighteen and three quarter cents.

For every cart or waggon, for every animal drawing the same, twelve and a half cents.

For every carryall drawn by two horses, eighteen and three quarter cents.

For every carryall drawn by one horse, twelve and a half cents.

For every person on foot, crossing either of the bridges of Gauly or Greenbrier rivers, six and a quarter cents.

And at the gate of Gauley bridge, for hogs and sheep, the same as at the other gates.

For every score of cattle, twenty-five cents; and so in proportion for a greater or less number.

For every horse, mare, mule or gelding, six and a quarter cents.

For every person travelling on horseback, eighteen and three quarter cents.

Every four wheeled riding carriage, for each horse drawing the same, twelve and a half cents.

Every four wheeled riding carriage drawn by two horses, thirty-seven and a half cents.

For every two wheeled riding carriage, twenty-five cents.

For every cart or waggon, for every animal drawing the same, eighteen and three quarter cents.

For every carryall drawn by two horses, twenty-five cents.

For every carryall drawn by one horse, eighteen and three quarter cents.

Provided always, That return waggons or carts, at all the gates, shall pay one-half of the said tolls or levy: *And provided also*, That persons on whose land any of the said toll-gates may stand, shall be exempt from tolls at such gate: *And provided further*, That persons owning plantations on both sides of any gate, not exceeding four miles distant from each other, shall be exempt from all tolls on their stock, implements of husbandry, and persons employed in conveying the same from one plantation to the other; and no other exemption than those provided for, shall be allowed.

6. *Be it further enacted*, That if any person in passing any bridge erected over any water-course crossing the same, shall commit any wanton or wilful injury to such bridge by locking waggons or otherwise, such individual, if a free person, shall forfeit and pay the sum of ten dollars, recoverable by warrant before a justice of the peace, one-half whereof l go to the informer, and the other to the Literary Fund;

and, if he or she be a slave, shall receive ten lashes on his or her bare back.

7. *And be it further enacted,* That the President and Directors of the James River Company, are hereby authorised and required to appropriate, from time to time, from the tolls which may be received upon said road, a sum sufficient to keep it in good repair.

8. *And be it further enacted,* That the President and Directors of the James River Company, are hereby authorised and required to attend to the completion of the works on the James river canal below Maiden's Adventure Falls.

9. This act shall be in force from the passing thereof.

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AN ACT,

To amend an act, entitled "an act, authorising a loan for the purposes of Internal Improvement."

[Passed March 8th, 1826.]

Whereas a mistake has occurred in an act, entitled "an act, authorising a loan for the purposes of Internal Improvement," passed the first day of March, eighteen hundred and twenty-six:

1. *Be it therefore enacted,* That the money directed to be borrowed by the said act, and the unexpended balance of the loan authorised to be borrowed by the act of the sixteenth of February, eighteen hundred and twenty-five, shall be appropriated toward completing the works commenced on the Kanawha river and road, and to extending the same in the manner prescribed by law; and to completing the James and Jackson's river canal, and the works thereon, to Maiden's Adventure Falls; and to completing the canal now constructing along the margin of James river, from the lower end of Irish Falls, in the county of Bedford, to the mouth of North river, in the county of Rockbridge.

2. *Be it further enacted,* That the reference in said act to the third section, shall be taken as referring to this act.

3. This act shall be in force from the passage thereof.

AN ACT,

To amend the Tariff of Tolls on the lower section of James river.

[Passed March 8th, 1826.]

1. *Be it enacted by the General Assembly*, That it shall be lawful for the President and Directors of the James River Company, in trust for this Commonwealth, to demand and receive, on the lower section of the James river canal, in lieu of the tolls heretofore allowed by law, tolls according to the following table and rates, viz: On every hogshead of tobacco, one dollar; on every hogshead of tobacco stems, twenty-five cents; on every hogshead of rum, wine, or French brandy, one dollar; on every hogshead containing other liquids, fifty cents; on all barrels and casks containing spirits, wine, and other liquids, in proportion to quality and quantity, as above; on every barrel of flour, ten cents and four mills; on every barrel of pork, beef or fish, twelve cents and five mills; on every ton of hemp, flax, bar iron, castings, lead or zinc, one dollar and fifty cents; on every ton of pig iron, fifty cents; on every ton of shucks, straw, hay, fodder or oats, twenty-five cents; on every ton of stone, manure, bricks, plaister, lime, oyster shells or sand, twelve cents and five mills; on every sack of salt, six cents and two and a half mills; on every bushel of wheat, one cent and six mills; on every bushel of coal of five pecks, one cent; on all other articles commonly sold by the bushel, one cent and five mills; on every cord of wood or bark, twelve cents and five mills; on every thousand staves, heading, shingles, boards or bolts, twenty-five cents; on every thousand laths or hoop poles, twelve cents and five mills; on every thousand feet of plank or scantling, thirty-five cents; all articles not enumerated, shall pay by the hundred weight, six cents and two and a half mills; one large empty boat, one dollar; one empty batteau, fifty cents.

2. All acts and parts of acts, coming within the purview of this act, shall be and the same are hereby repealed.

3. This act shall commence and be in force, from and after the passing thereof.

AN ACT,

Authorising the Board of Public Works to subscribe for a part of the stock of the Tye River and Blue Ridge Turnpike Company.

[Passed March 1st, 1826.]

1. *Be it enacted by the General Assembly,* That the Board of Public Works shall be authorised to subscribe, on behalf of the Commonwealth, for fifty shares of the stock of the Tye River and Blue Ridge Turnpike Company: *Provided,* The said Company consent to the appointment of two Directors to represent the State's interest therein: that the State participate in the dividends in proportion to the amount of its stock, and that the amount of the subscription hereby authorised, be appropriated exclusively towards the improvement and completion of the said road.

2. This act shall be in force from the passing thereof.

AN ACT,

Authorising an increase of the capital stock of the Falls Bridge Turnpike Company, and authorising the Board of Public Works to subscribe for a part of the stock of that Company.

[Passed February 22d, 1826.]

1. *Be it enacted by the General Assembly,* That the Falls Bridge Turnpike Company shall be and are hereby authorised to increase their capital stock by an addition of one hundred and sixty shares; and the Board of Public Works shall be, and are hereby authorised according to the provisions of the eleventh section of "an act, to create a fund for Internal Improvement," passed February 5th, 1816, to subscribe on behalf of the Commonwealth for eight thousand dollars of the stock of said Company, payable one-fourth on the first day of July, one thousand eight hundred and twenty-seven, and the remaining three-fourths in three semi-annual instalments: *Provided,* That the same be applied exclusively to the completing

of that part of the road which remains unfinished: *And provided, also*, That the fund for Internal Improvement shall participate in the dividends hereafter to be declared by said Company in proportion to the stock held by the Commonwealth: *And provided further*, That the stockholders consent to the appointment of two Directors by the said Board to represent the State's interest in said Company.

2. This act shall be in force from the passing thereof.

AN ACT,

Authorising the Shepherdstown and Smithfield Turnpike Company to increase their capital stock, and authorising the Board of Public Works to subscribe to the stock of that Company.

[Passed February 20th, 1826.]

1. *Be it enacted by the General Assembly*, That the Shepherdstown and Smithfield Turnpike Company, shall be authorised to increase their capital stock, and the Board of Public Works are hereby authorised to subscribe on behalf of the Commonwealth to the stock of said Company, the sum of eighteen thousand five hundred and seventy-five dollars, payable, one-fourth on the fifteenth day of January, eighteen hundred and twenty-eight, and the remaining three-fourths, in three semi-annual instalments of four thousand six hundred and forty-three dollars and seventy-five cents: *Provided*, That the money hereby authorised to be advanced to said Company, by taking part of the stock thereof, shall be applied exclusively to the completion of said road, should any part of it be unfinished, when the aforesaid sums of money shall respectively become payable: *And provided*, That the said Board shall be permitted to appoint three Directors to represent the State's interest in said Company: that the fund for Internal Improvement participate in all dividends declared by the Company after the time of paying in the different instalments subscribed by said Board, and that the Company furnish satisfactory evidence to the Board of Public Works, or to the ex-officio members thereof, that the whole stock subscribed by individuals has been secured according to law.

2. This act shall be in force from the passing thereof.

AN ACT,

Authorising the Board of Public Works to subscribe for a part of the stock of the Staunton and James River Turnpike Company.

[Passed February 24th, 1826.]

1. *Be it enacted by the General Assembly,* That the Board of Public Works shall be authorised to subscribe on behalf of the Commonwealth, to the stock of the Staunton and James River Turnpike Company, the sum of twenty thousand dollars, payable one-fourth on the fifteenth day of July, one thousand eight hundred and twenty-seven, and the remaining three-fourths in three semi-annual instalments, so soon as the said Company shall furnish evidence to the ex-officio members of the said Board, that thirty thousand dollars of said stock subscribed by individuals has been actually paid in, or secured according to law: *Provided,* That the fund for Internal Improvement participate in proportion to the stock subscribed, in all dividends declared by the Company, as the different instalments shall be paid: *And provided, also,* That the said Company consent to the appointment by the said Board of two Directors to represent the State's interest therein.

2. *Be it further enacted,* That if the Staunton and James River Turnpike Company shall, by contract with the stockholders of the Rockfish Gap Turnpike, extinguish their rights, before they shall expire by the provisions of the act creating them, and shall complete their road across the mountain at the said Gap, in the manner provided by the fifth section of the act passed the 8th day of March, 1824, entitled, "an act, to revive and amend an act, entitled 'an act, incorporating a company to establish a turnpike road from the town of Staunton to James river," then it shall be lawful for the said Staunton and James River Turnpike Company to demand and receive the same tolls for passing that section of their road, crossing the said mountain, as are now allowed by law to the stockholders of the said Rockfish Gap Turnpike, and to continue to receive them, until the rights of the said stockholders of the Rockfish Gap Turnpike would have expired by the provisions of the act creating them; after which time the tolls of the Staunton and James River Turnpike Company shall be regulated, in the same manner, as if this section had never been enacted.

3. This act shall be in force from the passing thereof.

AN ACT,

To amend the several laws concerning the Staunton and James River Turnpike Company.

[Passed January 5th, 1826.]

1. *Be it enacted by the General Assembly,* That the Staunton and James River Turnpike Company shall have power and authority to make the said road sixty feet wide instead of the width now authorised by law, or any lesser width which they may think proper, so that the same be at least twenty-two feet exclusive of side ditches in all places.

2. This act shall be in force from the passage thereof.

AN ACT,

To amend the act, concerning a road from the town of Staunton to the mouth of Little Kanawha.

[Passed February 13th, 1826.]

Whereas a survey has been made by the Engineer of this State, and the several sums of money have been raised, as authorised by an act of the General Assembly, passed the fifth day of March, one thousand eight hundred and twenty-four, for opening a road from Staunton to Parkersburg; and some additional Legislative provision is found necessary to carry the said act into effect:

1. *Be it therefore enacted by the General Assembly,* That the said road shall be laid out and made agreeably to the survey and location of the said Engineer, from the town of Staunton to the mouth of Riffle's Run in the county of Randolph; and for the purpose of completing the location of the said road, there shall be three Commissioners appointed, one of which shall be appointed by the county court of Randolph, one by the county court of Lewis, and one by the county court of Wood; the several courts of Randolph, Lewis and Wood, shall give one month's previous notice of their intention respectively to make said appointments, and in case of a vacancy from any cause, shall, as soon as may be, supply the same by another

appointment; and the said courts respectively, shall allow and pay to the said Commissioners out of their county levy, a reasonable compensation for their services, not exceeding two dollars per day each.

2. *Be it further enacted,* That so soon as the said Commissioners shall have been appointed as aforesaid, it shall be their duty to meet at Riffle's Run, in the said county of Randolph, and thence to locate and plainly mark out the said road, from the mouth of Riffle's Run, on the most eligible ground, by the town of Beverley in Randolph county, by Weston in Lewis county, and thence to Parkersburg in the county of Wood, and shall make a report of their proceedings to each of the said county courts of Randolph, Lewis and Wood, where the same shall be recorded.

3. *Be it further enacted,* That the county of Wood shall have two years after the passage of this act to raise their quota as prescribed in the first section of the before recited act: *Provided,* That the sheriff of said county, shall not be authorised to pay the sum of money therein mentioned, to the court of said county, until the said county shall have so raised their said quota.

4. This act shall be in force from the passing thereof.

AN ACT,

To amend the act, entitled "an act, to amend the act, entitled 'an act, to amend the several acts, concerning the Manchester and Petersburg Turnpike Company."

[Passed March 1st, 1826.]

1. *Be it enacted,* That the Manchester and Petersburg Turnpike Company, shall be exempted from all obligation of applying stone or gravel upon so much of the Manchester and Petersburg Turnpike road, as lies between Cattle Run, near Archibald Hatcher's new house, and the southern boundary of the lands of Charles E. Featherstone, except where stone or gravel shall be really necessary; to be ascertained by Commissioners appointed by the Executive as now provided by law: *Provided, nevertheless,* That the Legislature, may at any fu-

ture session, withdraw the exemption granted by this act, either in whole or in part, and require the said Turnpike Company to apply stone or gravel in the manner now prescribed by law to the whole or any part of the said turnpike road, upon which the said exemption is intended to operate.

2. This act shall be in force from the passing thereof.

AN ACT,

Allowing further time for the completion of the Snicker's Gap Turnpike Road, and to raise by Lottery, a sum of money for that purpose.

[Passed February 23d, 1826.]

1. *Be it enacted by the General Assembly,* That the President and Directors of the Snicker's Gap Turnpike Company shall be allowed the further time of one year, from the first day of February, eighteen hundred and twenty-six, to complete their road.

2. *Be it further enacted,* That the President and Directors of the said Company shall be, and are hereby authorised to raise by Lottery, a sum of money, not exceeding fifty thousand dollars, for the purpose of building a bridge across Goose creek, connecting the said turnpike road, and also for building a bridge across the Shenandoah river at the termination of the said road, and for continuing the same to Winchester.

3. *Be it further enacted,* That the said President and Directors shall be authorised to impose such tolls for passing the said bridges and the road aforesaid, as they may deem proper; which tolls shall be applied, from time to time, to the repairing of said bridges and keeping the aforesaid road in good order.

4. *And be it further enacted,* That it shall be the duty of the aforesaid President and Directors annually to report their proceedings, in pursuance of this act, to the Legislature, who shall at any time hereafter, have power to repeal, alter, or modify this act, in such manner as to them may seem to be proper.

5. This act shall be in force from the passing thereof.

AN ACT,

Authorising an extension of an arm of the Lynchburg and Salem Turnpike road, to Cocke or West street in the town of Lynchburg.

[Passed March 1st, 1826.]

1. *Be it enacted by the General Assembly,* That it shall be lawful to open books in the town of Lynchburg, under the direction of Samuel Clayton, John Early, John Thurman, David G. Murrell, and Samuel Nowlin, or any three of them, for receiving subscriptions to the amount of ten thousand dollars, for the purpose of extending an arm of the Lynchburg and Salem Turnpike road, from some suitable point on Cocke or West street in the town of Lynchburg, so as to intersect the said road at some convenient point between the town of Lynchburg and the first toll-gate.

2. *Be it further enacted,* That the persons who may subscribe towards making the arm of said turnpike road, or a majority of them, shall be authorised to appoint seven Commissioners, who, or a majority of them, shall be authorised to locate and contract for its construction, with such powers and privileges for that purpose as are granted by the act, entitled, "an act, prescribing certain general regulations for the incorporation of Turnpike Companies."

3. *Be it further enacted,* That the said Commissioners shall have full power and authority to enter upon all lands and tenements, and unimproved lots in said town, through which they may judge it necessary to make the said road, so that neither the dwelling house, yard, garden nor curtilage of any person, be invaded without his or her consent.

4. *And be it further enacted,* That it shall be lawful for the Commissioners aforesaid, to contract with the proprietors of lands through which the said road will pass, and cause to be entered of record in the corporation court of Lynchburg, all such conveyances; and if the said Commissioners, shall not be able to obtain the consent of the proprietors of all the lands and lots through which the said road is proposed to be made, they may apply to and obtain from the county court of Campbell, a writ of ad quod damnum, directed to the sheriff of Campbell county, commanding him to empannel a jury, whose duty it shall be to ascertain and fix the damages which the owners of lands and lots will sustain by the location of the said road in the manner proposed by the said Commissioners;

the damages assessed, shall be certified under the hands and seal of the jury, and by the sheriff returned to the court of his county; the Commissioners shall, out of the funds raised in manner aforesaid, pay to the proprietors of the lands and lots, the damages that shall be awarded them, by the finding of the jury, and the expenses incurred in holding the inquest. So soon as the said Commissioners shall have satisfied the damages awarded in manner aforesaid, it shall be lawful and right in them to proceed to the laying out and making the said road.

5. *And be it further enacted*, That there shall not be any toll demanded for passing the arm of said Turnpike road.

6. This act shall be in force from the passing thereof.

AN ACT,

Incorporating a Company to establish a Turnpike road from Covington to Lynchburg, and for other purposes.

[Passed March 1st, 1826.]

1. *Be it enacted by the General Assembly*, That it shall be lawful to open books at Covington, in the county of Alleghany, under the direction of Jesse Davis, John Persinger, John Callaghan, James Merry and William H. Terrell, or any three of them; at Lexington, in the county of Rockbridge, under the direction of Andrew Alexander, James Paxton, James Caruthers, senior, William Taylor and William Wilson, or any three of them; and at Lynchburg, in the county of Campbell, under the direction of David R. Edly, Elijah Fletcher, James Bullock, Henry Davis and David Hoofman, or any three of them, for receiving subscriptions to the amount of one hundred and twenty thousand dollars, for the purpose of making a Turnpike road from the town of Covington, in the county of Alleghany, through the town of Lexington, in the county of Rockbridge, to the town of Lynchburg, in the county of Campbell. When a sufficient number of shares shall have been subscribed, the subscribers, their heirs and assigns, shall be and are hereby incorporated into a Company, by the name of "The Covington and Lynchburg Turnpike Company;" agreeably to the act, entitled "an act, prescribing certain general regulations for the incorporation of Turnpike Compa-

nies:" *Provided*, That the said Company shall be governed by the provisions of the said act, except that they shall not be compelled to make the said road more than forty feet wide, nor cover it with gravel or stone, unless it shall at any time be found necessary; nor shall they be compelled to make a summer or side road thereto.

2. *Be it further enacted*, That the Board of Public Works shall be and they are hereby authorised, as soon as they may deem it expedient, and as soon as existing engagements will permit, to direct the Civil Engineer of the State to make a survey, and report upon the advantages and disadvantages of the aforesaid road; and also, of the shortest and best practicable route for a road from Covington to the city of Richmond.

3. This act shall be in force from the passing thereof.

RESOLUTIONS.

Resolution for causing a road to be located and surveyed from Danville to Wythe court-house.

(Agreed to by both Houses January 11th, 1825.)

Resolved by the General Assembly, That the Board of Public Works be, and they are hereby instructed to enquire into the expediency of directing the public engineer to survey and mark a way for a road, by the shortest practicable route, from the north end of the bridge across Dan river at Danville in the county of Pittsylvania, to Wythe court-house; and if they should deem such survey expedient, that they cause it to be made as soon as existing engagements may permit, and make report thereupon to the General Assembly.

Resolution for a survey and report of the most practicable route for connecting by a canal, the waters of Appomattox with the South Branch of Willis's river, and with Deep creek and Hudson's creek, in Powhatan county.

(Agreed to by both Houses, February 8th, 1825.)

Resolved by the General Assembly, That the Board of Public Works be instructed to direct the public engineer, if they should deem it expedient, as soon as existing engagements will permit, to survey and report the most practicable route for connecting, by a navigable canal, the waters of the Appomattox, with the South Branch of Willis's river, and also with Deep creek and Hudson's creek in Powhatan county; with an estimate of the probable cost thereof.

Resolution for surveying a route for a canal on the south side of James river.

(Agreed to by both Houses, February 14th, 1825.)

Resolved by the General Assembly, That the Board of Public Works be instructed to enquire into the expediency, and if expedient, to direct the public engineer, so soon as his previous engagements will permit, to make a survey of the most practicable and advantageous route for constructing a canal, on the south side of James river, from some point above and near Bosher's dam on said river to the town of Manchester; and that, in making such survey, he select such route as will render necessary the smallest number of locks possible; and that he make an estimate of the probable cost of such improvement; and that he report the same, together with the public benefits to be expected therefrom, to the Board of Public Works, to be laid before the Legislature next succeeding such survey.

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CONTAINING THE

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